JPRS 83214

7 April 1983

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 183

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FINNISH NUCLEAR FIRM MAY JOIN WITH USSR IN YUGOSLAVIA PLANT

Helsinki HELSINGIN SANOMAT in Finnish 2 Mar 83 p 29

[Text] Lovisa (HS)—Imatran Voima [IVO, Imatra Power Company] has announced that IVO and the Soviet plant supplier, Atomenergoexport (AEE), will apparently join forces in a Yugoslavian nuclear power plant project.

"If Yugoslavia decides to order the Soviet plant, Finns will participate, primarily in the planning of the plant," manager Ander Palmgren said. "Finland might also supply the nuclear power plant with some specialized equipment."

Together with IVO, AAE described its experience and know-how to the Yugoslavs last week in Zagreb. A six-man team from IVO and IVO Consulting Engineers Ltd. was present. They especially described the Lovisa plant to the Yugoslavs.

The first nuclear power plant in Yugoslavia went into operation recently. In addition they plan to build several nuclear power plants in the country by the year 2000. "There is keen interest in the continued development of nuclear power, even though water power and an abundance of their own really low-grade coal are still underdeveloped in Yugoslavia," Palmgren said.

All the other potential plant suppliers have visited Yugoslavia before IVO and AEE to promote nuclear power plant sales. However, the shortage of money limits Yugoslavia's development potential. Those at IVO state that during the current economic situation Yugoslavia is liable to have great difficulties in financing its energy projects, which means a slowdown in the planned program.

11,466
CSO: 5100/2573

PHYSICIST CLAIMS 90 PERCENT WOULD SURVIVE NUCLEAR WAR

Sydney THE SYDNEY MORNING HERALD in English 13 Jan 83 p 2

[Text]

Even in a full-scale nuclear exchange between the superpowers, most of the world's population — perhaps even 90 per cent — would survive, research by an Australian National University physicist, Dr Brian Martin, suggests.

Saying he did not wish to gloss over the fact that up to 500 million would be killed, Dr Martin goes on to argue that the little we know about the effects of a total nuclear war indicates that the 4,000 million who would survive are not likely to be killed by the long-range effects such as fallout and changes to the ozone layer.

Dr Martin is a prominent figure in the anti-uranium movement and is the author of a booklet, Nuclear Knights, which is a study of the pro-nuclear views of Sir Ernest Titterton and Sir Philip Baxter. He holds a PhD in theoretical physics from Sydney University.

Dr Martin argues that the idea of mankind becoming extinct in a nuclear war is dangerous nonsense. He attacks the notion of the "overkill" capacity of existing nuclear arsenals as misleading.

"Overkill" is defined as the ability to exterminate a population more than once and is often used as the basis for calculating how many people a nuclear bomb of a given size could kill.

"Many calculations of 'overkill' appear to be made using the nuclear attacks on Hiroshima and Nagasaki as a baseline," he says. "Estimates of the number of people killed at Hiroshima from a 13-kilotonne bomb range from 63,000 to over 200,000. Adopting a figure of 130,000 for illustrative purposes gives 10 people killed for each tonne of nuclear explosive."

From this it is usually deduced that explosion of 333,000 times as much explosive power — 4000 megatonnes (the amount he argues would be most likely to go off in an all-out war) — would kill 330,000 times as many people: that is, 40,000 million or nearly 10 times the present world population.

"But this factor of 10 is misleading. Suppose the bomb dropped on Hiroshima had been 1,000 times as powerful — 13 megatonnes. It could not have killed 1,000 times as many people, but at most the entire population of Hiroshima, perhaps 250,000 .

"Re-doing the 'overkill' calculation using these figures gives not a figure of 10 but of only 0.2. This example shows that crude linear extrapolations of this sort are unlikely to provide useful information about the effects of nuclear war.

"'Overkill' can be meaningful if applied to specific targets which will be attacked by several nuclear weapons. But applied to the entire world population the concept of 'overkill' is misleading.

"By the same logic it might be said that there is enough water in the oceans to drown everyone 10 times.

"It has been argued that if the megatonnage in nuclear arsenals were increased by 10 or 100 times and used in war, the fallout would be sufficient to threaten the life of most people on earth," say Dr Martin.

He argues that while the total number of warheads held by the superpowers and other countries has been increasing rapidly, the total megatonnage, the explosive power, has been decreasing quite a bit — from perhaps 60,000 in 1960 to about 11,000 now.

"The cancers and genetic defects caused by global fallout from a nuclear war would only appear over a period of many decades, and would cause only a small increase in the current rates of cancer and genetic defects.

"The scientific evidence clearly shows the global fallout from even the largest nuclear war poses no threat to the survival of the human species."

CSO: 5100/7517

GOVERNMENT BACKS PLAN FOR KOONGARRA URANIUM MINING

Canberra THE AUSTRALIAN in English 13 Jan 83 p 2

[Article by Errol Simper]

[Text] **THE Federal Government has backed a move by Denison Australia to mine the Northern Territory's controversial Koongarra uranium prospect, regardless of the lack of unanimous consent among traditional Aboriginal landholders.**

Denison is currently formulating detailed plans for its proposal to take the uranium from nine mining leases not subject to Aboriginal ownership provisions of the Aboriginal Land Rights (Northern Territory) Act.

The deputy Prime Minister and Minister for Trade and Resources, Mr Anthony, is understood to have agreed with the company its plan is the "only option" following failure by the 29 traditional owners to agree on whether the project should go ahead.

The disagreement among the Aborigines could cost them more than $100 million through their rejection of a 10 per cent equity, reportedly offered them in Koongarra Ltd, a holding company established by the part-Canadian-owned Denison.

The company still has to negotiate the terms and conditions of mining the nine leases with the traditional owners. But sources in Darwin say returns to the Aborigines will be considerably less than would have been the case. And the Aboriginal Northern Land Council accepts that Aborigines cannot prevent mining on the leases in question.

Four Aborigines, led by Mr Mick Alderson (a cultural adviser to the Northern Territory National Parks and Wildlife Service), are against allowing further mining negotiations between Denison and the council. And the Aboriginal Land Commissioner, Mr Justice Kearney, has said his interpretation of the Land Rights Act is that a unanimous decision is required.

Denison would make no official comment on its plans yesterday, but it is understood the mining of Koongarra on the "small lease" – as opposed to the enlarged area the company sought to utilise – will be less convenient, but possible.

Observers say that under the revised plans it will be far more difficult to implement environmental safeguards insisted on by the Fox Report, and Denison officials and Commonwealth environmental experts are already planning a series of discussions on mining plans.

Impasse

The moves are the latest twist in a 12-year battle to get Koongarra into production. Discovered in 1970 by another Canadian company, Noranda, its progress was inhibited by its proximity to the Kakadu National Park.

Denison bought the company from Noranda in 1980 but has been unable to reach agreement with Aboriginal owners. Ironically, it was disagreement among the owners themselves which caused the latest – and potentially most serious – impasse.

Footnote: Uranium is a highly-efficient fuel. It was discovered in 1789 by the German chemist, Martin Heinrich Klaproth, who named it after the planet Uranus. It was first isolated in the metallic state in 1842. A conventional nuclear reactor, generating 60,000kw, uses about 6.80kg of uranium-235 a month. This compares to a coal plant, which would use 18,143 kilos of coal to produce the same amount of energy.

CSO: 5100/7517

DEAL SIGNED TO SUPPLY UK FIRM WITH URANIUM FROM JABILUKA

Canberra THE WEEKEND AUSTRALIAN in English 15-16 Jan 83 p 1

[Article by Philip Beard and Vincent Blake]

[Text] **PANCONTINENTAL Mining Ltd has signed a $130 million contract with Britain's Central Electricity Generating Board to supply at least 4.3 million pounds of uranium oxide from the Jabiluka reserve.**

The contract, negotiated by the British Civil Uranium Procurement Organisation, was signed by the board's deputy chairman, Mr Fred Bonner. It calls for the delivery of the oxide over a 10-year period from 1988.

Details of the contract were published in the January issue of the British Nuclear Fuel Association journal and presented as a fait accompli. But no official announcement has been made in Australia.

The chairman of Pancontinental, Mr Tony Grey, was travelling to London last night and unavailable for comment.

It is the first contract involving ore from the Jabiluka reserve, Australia's largest and richest uranium deposit. Pancontinental holds 65 per cent equity in the project and its partner, the Getty Petroleum Group, holds the rest.

Interest

The contract represents less than a year's production of the Jabiluka project, which is scheduled to produce 3500 tonnes of uranium oxide a year (7.7 million pounds) at the beginning of stage one.

The Jabiluka partners will spend $650 million over three to four years to reach stage one production.

If the 4.3 million pounds is taken in equal instalments, it will represent 6 per cent of Jabiluka's initial capacity.

The contract price is not known but the Federal Government has imposed a $30-a-pound floor price on all contracts. At the floor price the 4.3 million pounds would net $129 million.

The CEGB contract is believed to be one of several Pancontinental has been engotiating for some time.

Jabiluka has estimated reserves of 200,000 tonnes.

CSO: 5100/7517

BRIEFS

RADIATION SAFETY CODE--The WA Government is drawing up new safety procedures to protect the health of mining workers and others who might be exposed to radiation. It will set up a mines radiation safety board, similar to the Mines Ventilation Board, to advise it on health issues. The Premier, Mr O'Connor, said yesterday that considerable progress had been made in developing tough new safety standards. A committee of government, union and industry representatives had agreed on a code of practice for mineral-sands mining. "The code, which has been adopted by the Radiological Council, lays down radiation safety standards which will have to be met by the industry," Mr O'Connor said. Until the new board was set up, an interim committee would advise on the code, he said. [Text] [Perth THE WEST AUSTRALIAN in English 15 Jan 83 p 25]

CSO: 5100/7517

NUCLEAR REACTOR IN JAVA NEARS COMPLETION

Jakarta KOMPAS in Indonesian 21 Dec 82 p 12

[Article: "Serpong Nuclear Reactor To Be Ready at the End of 1985--In the Year 2000, Fifty Percent of the Electricity in Indonesia Will be Generated by PLN]

[Excerpts] Indonesia will soon have a nuclear reactor with a capacity of 30 megawatts. The facility will be a test reactor located at Serpong, Tangerang, West Java. It is planned that the installation will be assembled and ready for operation by the end of 1985.

This was the statement made sometime ago by Wilfred Albert, deputy manager of the Interatom Project to a group of newspapermen who were visiting his firm's central offices in Munich, West Germany. Interatom is the company which is erecting the Indonesian reactor in West Java.

Albert said that the Indonesian project will be very important for energy generation in the future. It will provide the facilities for the irradiation of materials and will be able to perform work requiring standard doses of radiation and to manufacture nuclear fuel.

All test reactors are installations that can generate electricity by nuclear power. It is anticipated that the production of electricity in this manner will play an important role around the year 2000, when it reduces the dependency on, or replaces, fossil fuels which are widely used for the generation of electricity by conventional means.

At the present time, preparations for the installation of the test reactor are underway at the chosen site. Construction work on the reactor building, offices and storage space is moving ahead. In connection with the project, two Indonesian scientists who later will be joined by three others, are being trained in West Germany. They will become the nucleus of a group of experts who will manage the operations of the reactor.

Indonesia already has two nuclear test reactors: one in Bandung, the other in Yogyakarta. These two reactors are the property of BATAN, the National Atomic Energy Board. However, their combined capacity does not reach that of the new facility being erected at Serpong.

A while ago, it was announced that the government would build a nuclear power plant in the area of Gunung Muria, Lasem, north central Java. One of the problems always encountered in the erection of such plants is the disposal of nuclear wastes. From the technological point of view, the disposal of such nuclear wastes still has not been satisfactorily resolved.

Responding to questions concerning the prospects for nuclear power in Indonesia, Albert who, for several years has been stationed in this country in connection with the Serpong nuclear power project, said that Indonesia had to develop atomic power. This is an imperative for the nation because at the present level of consumption, fossil fuels will be running out in the year 2000. According to Albert, it would not be impossible at that time for Indonesia to become an energy-importing nation. In the meantime, the development of coal as a new source of energy cannot yet be undertaken on a large scale because of various problems. One of these problems is the pressing need for substantial capital investment.

Albert said that to fill Indonesian energy requirements which will be increasing well into the next century, at least 50 percent of the electricity in the nation will need to be generated by atomic power. The remainder will be derived to the maximum extent from coal, hydroelectric and geothermal sources. In the meantime, the role of fossil fuels in the generation of electric power should slowly diminish.

In the preparation of nuclear fuel, Indonesia is in a reasonably advantageous position because there are indications of uranium reserves in several areas. A recent survey disclosed that various localities in Kalimantan were the sites of rather substantial uranium deposits.

However, the problem remains as to whether such uranium deposits are commercially exploitable. And even if these uranium reserves were recoverable, there remains still another obstacle. To produce nuclear fuel, the uranium occurring in nature must then be enriched by a technological process that is closely held by only a few large countries, such as the United States and the Soviet Union.

9464
CSO: 5100/8102

POLAND

PRODUCTION OF SYNTHETIC LOCAL RADIOACTIVE FALLOUT DESCRIBED

Warsaw NUKLEONIKA in English No 4-5-6, Apr-May-Jun 81 pp 619-622

[Article by Krzysztof Zarnowiecki and Danuta Garus, Central Laboratory for Radiation Protection]

[Text]

The laboratory method of producing the local radioactive fall-out material has been developed. The compo sition and physicochemical properties of the material obtained are very similar to those of fall-out material from nearby surface nuclear explosion. The fission products are created during a neutron irradiation of melted sand grains containing uranium. The synthetic material is used for biological, agrotechnical and decontamination experimental studies.

Introduction

Experimental studies in the field of a local radioactive fall-out contamination require possessing of the fall-out material. A local radioactive fall-out has never been available in non-nuclear countries. Since the prohibition of nuclear weapon tests in the atmosphere even the nuclear countries are not in the possesion of recent local fall-out material for experimental purposes. Therefore the studies on production of the synthetic radioactive fall-out material has been started in some research centres. The synthetic fall-out described by Lane [1-3] substantially differs from produced by earth surface nuclear explosion. Lane's fall-out material contains one single radionuclide instead of the mixture of the fission products. The radioactive substance is deposited on the surface of the sand grains, and then covered with the layer of sodium silicate.

For experiments in the field of radiation protection we had to prepare the synthetic fall-out material containing all fission products inside the grains. The physical and radiochemical parameters of our synthetic product are very similar to those of the real local fall-out debris produced by a surface burst.

Preparation of the Synthetic Fall-Out Material

Solution of uranyl nitrate is added to a mixture of sand and distilled water under stirring. After few minutes uranium is distributed uniformly on the surface of sand grains. Water is then evaporated and sand grains with uranium deposit are spilled through the electric arc in the specially constructed oven. During this procedure the grains covered with uranium salt are totally or partly melted. A part of uranium penetrates into the sand material and as a result the stable composition is obtained. Additionally the dimensions of the sand grains are slightly changed and their shape becomes close to spherical. The uniformity of grains fraction is obtained by screening the sand through the analytical sieves. The material obtained in that mode is irradiated with neutrons in a reactor and fission products are formed in sand grains.

Discussion

The material obtained by described method is very similar to a fall-out material from a nearby-surface nuclear explosion as far as the main properties are concerned, that is: physical structure, granulation, composition of radioactive isotopes, radioactive decay rate, beta and gamma rays energy spectrum, specific activity, chemical composition of radioactive substance carrier, uranium concentration, radioactive substance solubility, activation products content. Assuming that for a nominal A-bomb of 20 kilotons (8.4×10^{13}J explosion energy) the uranium mass is 20 kg and the time of the energy release is 5×10^{-8} seconds [4] the average neutron flux density should be about 10^{30} cm^{-2}s^{-1}. The neutron flux density in the nuclear reactor core is some 16 orders of magnitude lower. In order to obtain similar burn-up value, having in mind the difference between the cross-section for thermal and fast neutrons, the time of irradiation in a reactor should be about 10 days.

Table 1. Comparison of the activity of the fission products with the activity of other radioactive campounds of synthetic fall-out material

Decay time	Fission products	^{239}Np + Pu	^{236}U	^{238}U	^{235}U
s	Bq				
10^5 10^7	1.3×10^{11} 7×10^8	10^9 400	8 8	1.7×10^4 1.7×10^4	2.5×10^4 2.5×10^4

For example, in the Table 1 calculated values of the activity of radioactive components of the synthetic fall-out material are given. One gram of uranium enriched up to 36% of ^{235}U isotope was irradiated in the neutron flux 10^{13} cm^{-2} s^{-1} during 10^6 seconds. The time delay after the irradiation was assumed to be 10^5 and 10^7 second, respectively. As can be seen from Table 1 the activity of any radioactive component of the synthetic fall-out material does not exceed 1% of the activity of fission products. Negligible amount of the same components are present in the A-bomb fall-out.

The neutron energy affects to some extent the yield of particular fission products. However, the theoretical analysis of fission products which contribute more than 0.1% each to the total activity 100 days after explosion has shown that for these isotopes there is no significant difference in their fission yield for thermal and fission-spectrum neutrons. The discrepancy in the yield caused by the neutron energy is lower than that caused by the different construction of the nuclear weapon.

It has been found from the detailed studies that the isotopic composition of the synthetic fall-out material differs remarkably from the composition of that produced by atomic burst only during a short time interval after the irradiation, approximately equal to the time of the irradiation in a reactor.

Earth surface nuclear explosion produces usually about 30 to 300 tons of a radioactive fall-out per equivalent of 1 kt (10^6 kg) of TNT. Assuming that 2.9×10^{23} fission product nuclei, produced by the explosion equivalent to a burst of 1 kt of TNT, being uniformly mixed with 100 tons of the earth debris [4, 5, 6], one can obtain that 1 gram of the fall-out material contains 2.9×10^{15} fission product nuclei. The specific activity of such material 24 hours after the explosion is about 4×10^9 Bq/g (Ca 0.1 Ci/g). To obtain the same specific activity of the synthetic material sand should contain 0.2% of uranium enriched up to 20% for thermal neutron flux density 3×10^{13} cm^{-2} s^{-1} and the 10^5 seconds reactor irradiation. Other combinations of these parameters can be considered. However one has to remember that:

— too low neutron flux density and corresponding to that long irradiation can result in a significant deviation of the radioisotopic composition of the synthetic fall-out material from that one obtained in a nuclear explosion,

— too low uranium enrichment can result in too high uranium-238 activity in comparison with fission products activity in the obtained material,

— too low amount of uranium-235 in the irradiated material and corresponding to that high required neutron fluence can result in too high ratio of the induced activity of the carrier material to the activity of fission products.

Results and Applications

The fixation of the fission products to the synthetic fall-out particles has been checked by the leaching test. After stirring of samples of synthetic fall-out for 30 minutes with distilled water or with the 0.1 M HCl solution less than 1% of the total activity was found in the solution. For the similar sample of the unmelted material, about 60% of fission products were leached.

The idea of the production method of the synthetic fall-out material was developed and patented by K. Żarnowiecki [7].

The synthetic fall-out material is produced in our laboratory according to the described method. The material is used for agrotechnical, biological and other studies.

Received August 1980
Revised April 1981

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CSO: 2020/23

ARGENTINA

BRIEFS

SEISMOLOGICAL STATION AT ATUCHA--San Juan, 23 Feb (TELAM)--The National Seismic Warning Institute has reported that it will install a seismological station at the Atucha II nuclear plant to study any seismic activity created by the operation of the nuclear plant. The station will go into operation in April or May 1984. [Buenos Aires TELAM in Spanish 1310 GMT 23 Feb 83 PY]

CSO: 5100/2047

BRAZIL

NUCLEBRAS LAYS OFF MORE EMPLOYEES; 250 CUT

PY120248 Rio de Janeiro JORNAL DO BRASIL in Portuguese 10 Mar 83 p 19

[Excerpts] Nuclebras yesterday laid off 250 employees from all levels of its subsidiary Nuclep -- Nuclebras Heavy Equipment, Inc. -- in Itaguai, thus reducing by 25 percent its .,000 employees. With this new reduction, the number of employees dismissed by the holding [given in English] company of the Brazilian nuclear system now amounts to 353 in less than 2 months. By the end of January 1983, Nuclen -- Nuclebras Engineering, Inc. -- had already dismissed 103 employees, including 42 engineers.

The cuts being carried out by Nuclebras are in keeping with the idea of readjusting the whole Brazilian nuclear program, since the government decided to postpone for 1 year the construction of the nuclear plants two and three of Angra dos Reis, thus extending the conclusion date to 1989/90; postponing "sine die" the initial works of the Sao Paulo plants of Iguape-1 and Iguape-2; and postponing for another year the orders for $100 million made to national industries.

The newest subsidiary, Nucon -- Nuclebras Constructor of Nuclear Plants, Inc. [Nuclebras Construtora de Centrais Nucleares S.A.] -- created 2 years ago, has 400 employees. It was reported yesterday at the plant that current Nuclebras President Dario Gomes intends to eliminate this subsidiary, transferring its functions to the already existing Nuclen, which had been responsible before for the management of the construction of Angra 2 and Angra 3.

Planalto Palace released yesterday in Brasilia a presidential decision to reinstate four Nuclebras directors for another 4-year term. These directors are Gen Jose Pinto Rabelo; Ney Freire de Oliveira Junior, Carlos Tadeu de Freitas Gomes and Ilmar Penna Marinho Junior, whose term will begin on 15 March. It is with General Pinto Rabelo that the president of the Union of Rio de Janeiro Engineers will set a meeting to discuss, according to him, "the arbitrary dismissals."

CSO: 5100/2045

NUCLEAR ENERGY OFFICIAL ON EXPANSION PLANS

PA152019 Bogota Domestic Service in Spanish 1730 GMT 14 Mar 83

[Excerpts] Bogota -- The Nuclear Affairs Institute, IAN, has plans to expand its services in the field of peaceful uses of nuclear energy, including such important sectors of development as medicine, agriculture, livestock, hydrology and hydroelectricity.

This was announced today by Ernesto Villarreal Silva, director of this state-run institute, who said that the expansion of services will take place once an initial agreement signed last year with Argentina for the purchase of equipment is concluded. He added that negotiations should be concluded this month, since the statement of intent was signed in October of last year, and the 6-month negotiating period it set forth expires in April.

Villarreal Silva also said that for the first time in Colombia there are plans to produce the radioisotopes used in nuclear medicine, which are presently imported in quantities costing over 23 million pesos [no time period specified].

There are also plans to purchase a reactor able to generate between 3,000 and 5,000 kilowatts, since the one we currently have only produces 20 kilowatts [as heard], which is insufficient for present demands, Villarreal said.

He also announced that the institute has been considering the purchase of a uranium metallurgy plant, which would consist of a laboratory to produce uranium concentrate, a spectrometer, equipment for absorption analysis, and equipment for chemical analysis of plasma sources.

Other services provided by the IAN are: In the agricultural field, treatment of seeds to prevent and control disease; in the hydrology field, nuclear energy for studies to detect leaks in dams or pipes; in the hydroelectricity field, detection of leaks in the energy ducts of hydroelectric plants; in the field of radiologic safety, providing oversight and advice for those who use nuclear energy in order to prevent accidents and to make sure that they can perform their duties without any risk.

CSO: 5100/2046

BRIEFS

AID TO AEC--International ATomic Energy Agency (IAEA) will provide $ 8 lakh to Bangladesh Atomic Energy Commission during the year 1983 under the regular technical cooperation programme. This assistance to BAEC was announced at a meeting held on Thursday between the IAEA officials and Dr. Anwar Hossam Chairman Bangladesh Atomic Energy Commission and other officials of BAEC. Dr. C. G. Lamm, Deputy Director, Joint IAEA FAO division and Dr. D. A. Netsinghe Area Officer, Asia and Pacific Section of IAEA are now visiting Bangladesh to see the implementation of the projects under IAEA technical cooperation programme. [Dhaka THE BANGLADESH OBSERVER in English 11 Feb 83 p 12]

CSO: 5100/7064

REACTION TO 'WASHINGTON POST' ARTICLE ON PLUTONIUM

Report on Article

Bombay THE TIMES OF INDIA in English 22 Feb 83 p 1

[Article by J.N. Parimoo]

[Text] Washington, February 21: The WASHINGTON POST on Saturday carried a report which says that the plutonium that the Indians have been separating from the spent fuel since November is "being kept in a storage room where it will be held until Indian officials decide its use."

The POST quotes a U.S. government official to say that "there is simply no reason connected to their civilian nuclear programmes why any of these countries--India, Pakistan, Argentina and Brazil--need to begin stockpiling separated plutonium in this decade. It makes no use in any atomic power context."

According to the WASHINGTON POST, "the Tarapur facility is designed to reprocess one hundred tonnes of spent fuel annually, if operated at full capacity--highly unlikely since commercial reprocessing plants frequently encounter problems. The plant would be able to separate at full capacity 135 to 150 kilogrammes of plutonium per year. Six to eight kilogrammes are needed for a nuclear weapon.

"The ability to separate plutonium on this large a scale puts India far ahead of Pakistan, which has built but not yet begun to operate a much smaller reprocessing plant on the outskirts of Islamabad. It also puts India well ahead of countries such as Argentina and Brazil which have laboratory scale reprocessing facilities where years might be required to separate enough plutonium for a single nuclear weapon. But Pakistan is trying to complete a reprocessing plant even larger than Tarapur from a French design."

Expert's Comment

Bombay THE TIMES OF INDIA in English 22 Feb 83 p 9

[Article by K. Subrahmanyam]

[Text] New Delhi, February 21. The report about India reprocessing the Rajasthan reactor plutonium has been misrepresented in certain sections of the foreign press. Accounts have appeared about this reprocessed plutonium providing material for many bombs.

Such accounts overlook the fact that though the U.S. has many tonnes of plutonium in the irradiated fuel roads of their power reactors, a separate facility is being put up to make bomb-grade plutonium for additional warheads to be made under President Reagan's rearmament programme.

Even the U.S., with all its sophistication, is not in a position to use its vast quantities of reactor-grade plutonium for weapon purposes even though it claims to have used reactor-grade plutonium for an explosion.

The international fuel cycle evaluation conference had remarked that no country in the world had so far launched on a weapons programme with reactor-grade plutonium. As Congressman Mike McCormack remarked in an interview in the U.S. NEWS AND WORLD REPORT of August 18, 1980, what the U.S. experiment proved was that reactor-grade plutonium was totally unsatisfactory for weapons.

The reason for this is that the reactor-grade plutonium consists of a significant percentage of isotope plutonium-240 which undergoes fission very readily. Therefore, in a bomb made with reactor-grade material, the plutonium-240 produces a phenomenon called predetonation which prevents an efficient nuclear explosion with predictable yield.

Secondly, since the reactor-grade plutonium undergoes spontaneous fission, its presence in significant percentage will heat up the plutonium core in the bomb assembly and the conventional explosive lens around the plutonium core will melt if it is kept over a period of time. It will, therefore, be difficult to have an efficient explosive lens which will lead to an effective implosion to start the chain reaction.

It is understood that the 1965 experiment in the U.S. was carried out immediately after the assembly of the device and even during that short period it had to be kept under refrigeration. It is, therefore, extremely doubtful whether usable weapons can be made out of the reactor-grade plutonium.

On the other hand, beside spending money on putting up a separate plant to manufacture weapon-grade plutonium, the U.S. is also developing the technology of isotopic separation to sift plutonium-239 from plutonium-240 using lasers.

In the circumstances, the U.S. press reports about the reprocessed Rajasthan plutonium being available for bomb-making appear to be a part of a campaign to obfuscate the fact of the U.S. continuing to assist Pakistan with supply of sophisticated weapon systems even after many U.S. senators and congressmen have expressed concern over the possibility of cooperation between China and Pakistan on nuclear weapon technology transfer.

The plutonium reprocessing in India is being done under the system of the International Atomic Energy Agency safeguards. The only case of established clandestine proliferation--that of Israel--was possible because the Israelis stole bomb-grade material from the U.S. military nuclear facility of Numec, Apollo, Pennsylvania, and opened their own Dimona reactor to produce bomb-grade plutonium.

To characterise the present reprocessing in India as leading to capability for producing nuclear weapons out of this material is to cast doubts on the entire system of IAEA safeguards of the non-proliferation treaty. If the implication underlying such despatches is to be carried to its logical conclusion, then the safeguards are to be deemed as useless and the U.S. should give up the attempt at enforcing any safeguard system at all.

Washington Correspondent's Report

Madras THE HINDU in English 22 Feb 83 p 1

[Article by R. Chakrapani]

[Text] Washington, Feb. 21. Indian circles here are intrigued at reports appearing in the American Press that India has started production of "weapons-grade plutonium" on a large-scale at the reprocessing plant at Tarapur and that India is emerging as the first developing country to begin stockpiling separated plutonium at a rate that would enable it to build 20 atomic bombs a year if it chooses to build a nuclear arasenal.

THE NEW YORK TIMES carried a report today quoting unidentified U.S. Government officials as saying that the Tarapur reprocessing operation was, however, being monitored by international inspectors to see if the plutonium is diverted to military use. According to the report, a State Department official is said to have expressed U.S. concern on numerous occasions about the spread of nuclear reprocessing facilities, "especially in areas of potential instability such as southern Asia."

"Nothing Illegal"

"We have had a long and unpleasant history with India on this subject," the official is quoted as saying. But, according to the newspaper's account, the American official said that India had done nothing illegal, and that no special action was contemplated by Washington outside of general expression of displeasure.

In a more sensationalised report earlier, the WASHINGTON POST yesterday in a front-page report made the point that the alleged "large-scale reprocessing" in India marks the beginning of the era when nations without nuclear arsenals start accumulating sizable stockpiles of separated plutonium. "There simply is no reason connected to their civilian power programmes why any of these countries need to begin stockpiling separated plutonium in this decade," a U.S. Government official is quoted as commenting. "It makes no sense in an atomic context at all."

According to the POST report, the policy to separate plutonium on this scale, puts India far ahead of Brazil which have only laboratory scale reprocessing facilities where years may require to separate enough plutonium for making a single nuclear weapon. The only non-nuclear weapons country other than India operating a commercial-size reprocessing plant and stockpiling large quantities of separated plutonium, according to the report, is Japan.

U.S. Trying To Apply Pressure?

Indian embassy sources have promptly denied allegations of production of weapons-grade plutonium and put the Indian nuclear programme and reprocessing activity in proper perspective. They have also made it clear, once again, that India has no intention of making the bomb. The plutonium obtained from reprocessing would either go into a fast-breeder reactor or other civilian applications of nuclear energy.

What is intriguing Indian circles is why these reports are being orchestrated in public while in recent official dialogues between India and the U.S. there have been no mention about the reprocessing activity undertaken on an experimental basis at the Tarapur plant.

It is possible that the U.S. is trying to apply pressure on India to accept fullscope safeguards before taking action on India's long-pending application for the import of spare parts from the U.S. for the Tarapur nuclear plant. While an understanding was reached during Mrs Indira Gandhi's visit to Washington for allowing France to meet the uranium requirements for Tarapur, the issue of spare parts was left undecided. Both Governments are having talks on these supplies for which congressional approval will be necessary.

Spokesman's Denial

Bombay THE TIMES OF INDIA in English 23 Feb 83 p 1

[Text] New Delhi, February 22: The report in a Washington daily that India was readying itself to build about 20 atomic bombs a year was officially described here today as "utterly irresponsible and possibly mischievous."

The report on India's spent nuclear fuel reprocessing operations followed a similar report in another American daily some days ago. The timing of this press campaign against India's peaceful nuclear programme has been noted to observers here. This is being done just before the nonaligned summit and when the commercial terms of the French nuclear fuel supply for Tarapur are being tied up. India's request to the U.S. for spare parts for Tarapur is still pending.

In reply to questions, a spokesman of the external affairs ministry said that the press report had tried to link this peaceful nuclear programme with a totally false scenario. There was nothing secret or surreptitious about the work being undertaken at the Tarapur reprocessing plant.

Scientists' Comment

Bombay THE TIMES OF INDIA in English 23 Feb 83 p 1

[Text]

BOMBAY, February 22.

AMERICAN press reports have made "a mountain out of a molehill" when India has hardly reprocessed 15 kg of plutonium from the Rajasthan spent fuel, according to well-informed nuclear scientists here.

Since early October, 1,760 irradiated fuel bundles from Rajasthan have been transported to the Power Reactor Fuel Reprocessing (PREFRE) plant at Tarapur. Till the end of 1982, the Rajasthan atomic power station had accumulated a little over 15,000 spent fuel bundles.

Each bundle weighs about 15 kg and hardly 0.3 per cent of it is plutonium. Assuming that all that 1,760 bundles of the RAPS had been reprocessed, the plutonium yield works out about 10 kg.

When the capacity of the PREFRE is given as 100 tonnes per annum it means that the plant can reprocess 100 tonnes of spent fuel and the annual output of plutonium would be around 70 kg.

To start the Fast Breeder Test Reactor at Madras, India needs at least 100 kg of plutonium and hence the effort is to conserve every gramme of it, a source said.

That reprocessing of the Rajasthan fuel would begin soon had been widely reported in the Indian press on April 17, 1982. The department of atomic energy's annual report for 1981-82 itself gave indication of this.

Later, in September, at the IAEA's international conference held in Vienna, India had presented a paper on fuel reprocessing experience and the DAE's official magazine, "Nuclear India" published the paper in full in its special issue.

The PREFRE at Tarapur was commissioned in 1976 and the plant is not tucked away in any inaccessible corner.

The first pilot reprocessing plant was set up in Trombay in 1964 and the plant provided the plutonium for the Pokhran explosion. The plant has now been successfully "decommissioned", which is a technological feat in itself.

Incidentally, when the report on reprocessing first appeared in the U.S. a French team was in Bombay finalising the details for the supply of fuel to Tarapur.

It is also considered odd that the first news report quoted its source as an American technical news letter "Nuclear Fuel" which is a relatively unknown journal.

A section of the nuclear scientists feel it is needless to take a defensive attitude towards the American propaganda. The American press reports should be met squarely by asserting our right to reprocess the spent fuel.

To say that India was "stockpiling" plutonium unnecessarily was not very different from saying that nuclear power plants were unnecessary for India, they feel. After all, India has nuclear power plants and hence, the spent fuel. What should we do with the stuff instead of reprocessing it, asked a DAE source.

The total capital investment at PREFRE has been estimated at Rs. 31 crores. The unit cost of reprocessing at 60 per cent capacity is about $ 190 per kg in a plant of the size of PREFRE. In reprocessing plant which is at least three times the size of PREFRE the estimated unit cost is more than $ 300. This encime excludes the cost of transportation and waste management.

India has found the small size plants economical and hence, reprocessing plants at Kalpakkam, near Madras and at Narora have already been planned. This would obviate the hardships faced in transporting the spent fuel over a long distance.

G.K. Reddy Report

Madras THE HINDU in English 23 Feb 83 p 1

[Article by G.K. Reddy]

[Text] New Delhi, Feb. 22. The Government has taken due note of the campaign of disinformation directed against India by some interested powers on the eve of the nonaligned summit conference, either to misrepresent the country's policies or create doubts about its capacity to cope with the mounting challenges to its preeminent position in the third world.

The Soviet press has been giving wide publicity to reports appearing in an Indian newspaper of an alleged U.S. bid to destabilise and balkanise India as part of a diabolical conspiracy to destroy its importance.

Now some U.S. newspapers have come forward with what a spokesman of the External Affairs Ministry described today as "utterly irresponsible and possibly mischievous" reports that India has been reprocessing the spent fuel from the Rajasthan Atomic Power Plant (RAPP) at the Tarapur facility for producing weapons grade plutonium which would give the countrythe capability to build about 20 atomic bombs a year.

He said there was nothing "secret or surreptitious" about this reprocessing, since it was widely known that after successful trial runs India had started reprocessing the spent fuel from RAPP since November last. The reprocessing of spent fuel was an integral part of nuclear power generation for peaceful uses, and the plutonium derived from this operation is primarily intended to be ploughed back into a self-generating power programme.

Two aspects: There are two aspects of this controversy which have acquired political overtones as though India was all set on clandestinely embarking on nuclear weapon manufacture by misuing the spent fuel from power reactors for this purpose. First of all, the spent fuel from RAPP as well as the reprocessing plant at Tarapur are subject to international safeguards and IAEA inspection. Secondly, the plutonium derived from reprocessing this spent fuel is not of weapon grade, since it contains a high proportion of isotope 239 that cannot be easily eliminated to achieve the necessary degree of 240 purity for explosion.

Though India terminated the nuclear cooperation agreement with Canada in 1976 following Ottawa's refusal to fulfill its commitments in the wake of the Pokhran explosion, it allowed IAEA to continue to inspect the Rajasthan plant as a token of its commitment to use atomic energy only for peaceful purposes. The heavy water that was obtained from the Soviet Union for the second reactor was subject to more stringent conditions.

The reprocessing plant built by India at Tarapur has been certified by IAEA as safeguardable. So there is no question of any diversion of the nonweapon grade plutonium derived from reprocessing the spent fuel from RAPP at Tarapur without the IAEA's knowledge. If this plutonium is going to be used in the fast breeder reactor at Kalpakkam it will also be for peaceful purposes.

Has capacity: Thee is no doubt that India has the capacity to produce weapons grade plutonium from the CIRUS experimental reactor at Trombay which is not subject to IAEA inspection. The much bigger research reactor named R-5 that is being built at Trombay will be able to produce larger quantities of purer plutonium if India decides to switch over to a weapons programme.

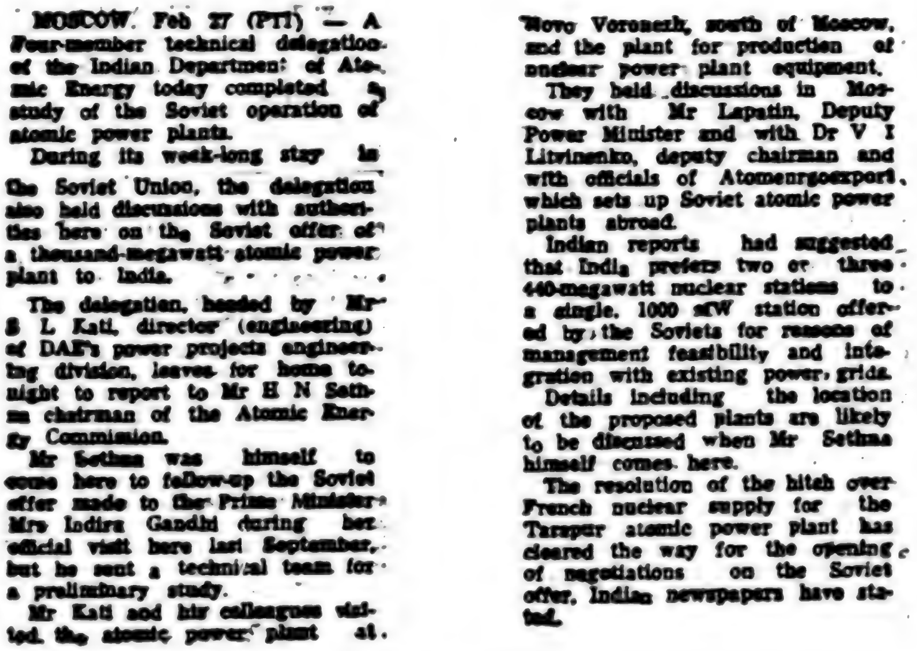
But at the moment all countries concerned know only too well that India has no such intentions, that its entire effort is concentrated on developing indigenous capacity for entering the era of fast breeders and development of the throium fuel cycle for unlimited power production.

CSO: 5100/7065

AEC TEAM STUDIES NUCLEAR PLANTS IN USSR

New Delhi PATRIOT in English 28 Feb 83 p 1

[Text]



MOSCOW, Feb 27 (PTI) — A four-member technical delegation of the Indian Department of Atomic Energy today completed a study of the Soviet operation of atomic power plants.

During its week-long stay in the Soviet Union, the delegation also held discussions with authorities here on the Soviet offer of a thousand-megawatt atomic power plant to India.

The delegation, headed by Mr S L Kati, director (engineering) of DAE's power projects engineering division, leaves for home tonight to report to Mr H N Sethna chairman of the Atomic Energy Commission.

Mr Sethna was himself to come here to follow-up the Soviet offer made to the Prime Minister Mrs Indira Gandhi during her official visit here last September, but he sent a technical team for a preliminary study.

Mr Kati and his colleagues visited the atomic power plant at Novo Voronezh, south of Moscow, and the plant for production of nuclear power plant equipment.

They held discussions in Moscow with Mr Lapatin, Deputy Power Minister and with Dr V I Litvinenko, deputy chairman and with officials of Atomenrgoexport, which sets up Soviet atomic power plants abroad.

Indian reports had suggested that India prefers two or three 440-megawatt nuclear stations to a single, 1000 MW station offered by the Soviets for reasons of management feasibility and integration with existing power grids.

Details including the location of the proposed plants are likely to be discussed when Mr Sethna himself comes here.

The resolution of the hitch over French nuclear supply for the Tarapur atomic power plant has cleared the way for the opening of negotiations on the Soviet offer, Indian newspapers have stated.

CSO: 5100/7068

DELHI URGED TO PRESERVE NUCLEAR ENERGY OPTIONS

Madras THE HINDU in English 7 Feb 83 p 8

[Editorial]

[Text] THE MOVE BY the Board of Governors of the International Atomic Energy Agency to pay special attention to the content of the substitute fuel supply arrangement for the Tarapur atomic energy station is not surprising, but it does provide a warning of the complications in store for the unorthodox arrangement involving four parties — India, France, the United States and the IAEA. The point at issue is whether India can expect to get away with the old (1963) restrictions on the operations of Tarapur or whether it will be made eventually to bend to the pressure to accept the far more stringent terms that are part of a third generation nuclear supply arrangement (that the 1963 Indo-U.S. nuclear cooperation agreement emphatically is not). The IAEA, which seems to represent primarily the interests of the supplier powers, can naturally be expected to insist on the most restrictive interpretation sustainable under the circumstances.

Unfortunately, as this newspaper has had occasion to point out in its editorial columns, short-term political considerations rather than a deep and technically competent look at the issues as they might develop in the period ahead prompted the Government of India to enter into a deal with the United States and France involving some compromises and hidden risks for the country's nuclear programme. At the heart of the current problem is the dispute over the "perpetuity" issue — a concept laid down in the document adopted by the IAEA's Board of Governors in 1973, known as GOV 1621. The Indian interpretation of the 1963 bilateral agreement has, from the start, ruled out any "in perpetuity" application of the external safeguards and other restrictions on the station. The basic Indian position, underlined in the negotiations with the United States in 1981 and with France in 1982, is that the Tarapur relationship is — in contrast to a third generation nuclear supply relationship — a time-bound, conditional affair(no supply, no obligation). On the other hand, the United States as the original supplier has insisted that its rights under the original agreement are vested rights and will continue indefinitely. And the French Government, as the substitute supplier, has left no one in doubt that it is coming in consciously as a member of the "London Club" of nuclear suppliers. During the tricky negotiations that were brought to a conclusion coinciding with President Mitterrand's recent visit, India resisted French suggestions that it conclude a seperate agreement with the IAEA to cover the new supply relationship and also commit itself firmly to a resolution of the disagreement over the terms (chiefly the question of what would happen to the safeguards and other restrictions on the spent fuel and derivative material after 1993). The nuclear supply relationship entered into with France reflects "essentially a blurring of the issues, an artful ambiguity worked into the text." On the one side, the new relationship is to be "within the framework of the 1963 agreement" and France is coming in as a supplier "in lieu of the U.S." On the other, the accord commits both parties (during the life of the 1963 agreement) to consultations "with a view to agreeing on the arrangements to ensure the implementation as may be necessary" of the provisions of the accord. While Indian spokesmen have maintained that there can be no question of continuing the external restrictions beyond 1993, in Mr. Mitterrand's public interpretation the reference has meant consultations to decide on all arrangements relating to the issue of spent nuclear fuel and its derivatives *after 1993*. Now, how is this significant divergence, if not dispute, over the terms to be resolved? It is here that the IAEA, as the agency administering the safeguards and as the custodian of the discriminatory conscience of the global nuclear bargain, might come in given half an opportunity. For one thing, its Director-General, Mr. Hans Blix, has reportedly conveyed unhappiness over the drafting of a new relationship without consultations with his agency. It is for India, as a non-signatory to the unequal Nuclear Non-Proliferation Treaty, to be vigilant and stand up to these concerted pressures — so that the independence and integrity of its nuclear energy options can be safe.

CSO: 5100/7062

CONTRACT FOR TARAPUR FUEL SUPPLY FINALIZED

Bombay THE TIMES OF INDIA in English 25 Feb 83 p 9

[Text]

NEW DELHI, February 24.

INDIA and France have finalised a draft of the commercial contract for the supply of French nuclear fuel for the Tarapur atomic power station. The draft now awaits formal approval by the two governments.

This was stated by the Prime Minister, Mrs. Indira Gandhi, in a written reply in the Rajya Sabha today. She said pending conclusion of the commercial contract with France and the commencement of fuel supplies, the Tarapur power plant was being operated at a lower generation level because of the shortage of fuel.

The commercial contract with France has been drawn up following an agreement concluded between India and France on November 26, in which France agreed to supply enriched uranium in the place of the United States. This agreement was reached within the framework of the Indo-U.S. cooperation agreement of 1963.

In reply to another question, Mrs. Gandhi reiterated that the policy of the government was to utilise atomic energy for peaceful purposes.

Mrs. Gandhi also informed the house that the arrangement regarding the supply of the French fuel supplies within the framework of the 1963 Indo-U.S. agreement had been confirmed by India and the U.S. by an exchange of notes on November 30.

REACTORS' LIFE

She said a decision on reprocessing the spent fuel from the Tarapur atomic power station would be taken at an appropriate time.

Replying to a question, she said while two of the research reactors would reach the end of their design lives by 1990, it was not proposed to decommission them because they would continue to be safely operable and useful. Modifications in this would continue to improve their usefulness and their life.

A third research reactor would, however, be decommissioned shortly. The atomic energy department had the expertise for decommissioning reactors and it would initiate action at the proper time, Mrs. Gandhi said.

In reply to a question on the Soviet offer of assistance in setting up a nuclear power station in India, Mrs. Gandhi said an Indian delegation was presently in the Soviet Union to ascertain various technical details of the offer. Based on the report of the delegation, the government would examine the offer from various angles before taking a final decision.

On the country's heavy water production programme, Mrs. Gandhi said alternative processes in addition to the existing technologies were being developed. Currently three heavy water plants were under operation and two were being commissioned. Two more plants were being constructed, she said.

She assured the house that the department was trying to produce a sufficient quantity of heavy water.

CSO: 5100/7066

INDIA

BRIEFS

NUCLEAR POWER TARGET--Bombay, February 24: The department of atomic energy has fixed the target of 10,000 MWe of nuclear power by the turn of the century and, to achieve this target, it is proposed to initiate construction of a number of 235 MW units to be followed by 500 MW units in the eighties. Disclosing this at a meeting held by the All India Manufacturers' Organisation here recently, Dr. H.N. Sethna, chairman, Atomic Energy Commission, said that a matching increase in the production of uranium fuel and heavy water was required. Dr. Sethna, who was speaking on "Prospects and programme for nuclear energy in the eighties," pointed out that all this would require adequate mobilisation of the manufacturing industry for effecting timely supplies of equipment and components. In the context of the present difficulties, the target of 10,000 MW by 2,000 may appear ambitious, but it should be remembered that, even with this target, the contribution of nuclear electricity would be only around 10 percent of the total electricity generation at that time, according to Dr Sethna. [Text] [Bombay THE TIMES OF INDIA in English 25 Feb 83 p 2]

KALPAKKAM PLANT DELAY--MADRAS, Feb. 5--India's atomic explosion in 1976 had contributed to the delay in the commissioning of the Kalpakkam atomic power station, the Electricity Minister, Mr. S. Ramachandran, said in the Legislative Assembly today. Intervening in the discussion on the State Electricity Board budget, the Minister explained that when work on the Kalpakkam project was taken up in 1964, the State was given to understand that it would come to function in 1973-74. But it was not commissioned as scheduled. After the country exploded its first atomic device, Cannada, which had been assisting the project, declined to cooperate unless India signed the nuclear non-proliferation treaty, and that had complicated the problem, leading to further delay. The Minister's explanation came in the wake of a ruling party member, Mr. I. Ganesh's charge that the Centre had failed t keep to the original schedule. Mr. N. S. V. Chithan (Cong.-I) took exception to the AIADMK member's remarks, saying that the Minister himself had told the House the other day that the problem of getting heavy water for the plant was out of the hands of the Central Government. [Excerpt] [Madras THE HINDU in English 6 Feb 83 p 13]

NUCLEAR TECHNOLOGY CENTER--NEW DELHI, Feb. 8--The Department of Atomic Enegy has decided to establish a centre for advanced technology at Indore. Work on the project will begin soon. It was officially announced here that the centre would house research and development programmes in such frontier areas as controlled thermonuclear fusion, lasers, advanced accelerators, micro electronics and cryogenics. [Madras THE HINDU in English 9 Feb 83 p 16]

CSO: 5100/7063

LAND APPROVED FOR U.S. REACTOR RESEARCH

TA141245 Tel Aviv DAVAR in Hebrew 14 Mar 83 p 3

[Report by Arnon Magen]

[Text] Israel is prepared to allocate a plot of land to the U.S. (INESCU) company for experiments in the production of nuclear energy by the fusion method according to the (rigtron) model, but not to give the project the recognition given for an approved project, nor to allocate funds to it in the form of grants and loans.

Science and Development Minister Yuval Ne'eman said this to the enterepreneurs and investors of the (INESCU) company, the owner of the project, in two meetings he held recently with them at the U.S. Princeton University.

The minister clarified the position of the Cabinet, which does not intend to participate in financing the project, whose costs are estimated at $500 million spread over 5 years. Israel is nevertheless prepared to put at the entrepreneurs' disposal a plot of land and various services, including local professional manpower.

The DAVAR correspondent has learned that the land to be offered to them is in northern Samaria, namely in a region whose political future is problematic, at least in the eyes of the U.S. elements that stand behind the project. If one adds to this the Israeli Government's refusal to participate in financing, it seems that the chances of the project being set up in Israel are rather slim.

Fusion reactors are nuclear reactors operated through atomic merging of heavy hydrogen and helium while creating energy, as contrasted with the existing nuclear reactors where energy is produced by the splitting of the nuclei of the heavy elements. Research on the establishment of fusion reactions are being carried out in the United States, West Europe, and the Soviet Union, so far with gigantic investments and numerous difficulties. Even the optimists do not believe that the first reactor of this kind will be operated before the year 2000. The project proposed to the Israeli Government talks of fusion reactor of the new (rigtron) model which is based on the use of relatively cheap facilities but with a very short life span of approximately a month. Reactors of this kind are now undergoing initial stages of experimentation.

CSO: 5100/4505

PUBLIC INTEREST IN SAFETY OF NUCLEAR REACTORS DISCUSSED

Johannesburg THE STAR in English 18, 21, 22 Feb 83

[Three-part series by J. Manuel Correia]

[18 Feb 83 p 7]

[Text] With South Africa about to take a giant step into the nuclear age the public still wants to know how safe is it?

The answer: as safe as they can make it.

The public's watchdog, the newly created Council for Nuclear Safety, is convinced its standards are among the best in the world.

Council chairman Mr Stanley Craib, said unless his council was satisfied a nuclear facility met its standards it would veto it.

The 14 member was appointed by the Minister of Mineral and Energy Affairs.

Four of the 14 four represent Government departments — the Office of the Prime Minister, the Department of Health and Welfare, the Department of Trasport Affairs and the Department of Environmental Affairs.

The council can draw on a wide variety of expertise inthe engineering and scientific professions through its members. Utilising the resources of, the Industrial Development Corporation, universities, the Council for Scientific and Industrial Research, the South African Bureau of Standards and the National Occupational Safety Association.

It is not a toothless bulldog either.

Although the Atomic Energy Corporation issues licences for nuclear facilities under terms of the 1983 Nuclear Energy Act the council can refuse to sanction the licence if it is not satisfied with safety standards.

If such a dispute arises the problem will land in the lap of the Minister who will, quite literally, be in the "hot" seat.

If the council is not satisfied with arrangements at the newly-established national nuclear wastes repository near Gamoep in Namaqualand it will ensure conditions meet the stringent standards laid down.

The council grew out of the old Nuclear Safety Advisory Committee to the former Atomic Energy Board, which were changed by last year's act.

The advisory committee functioned for 10 years and to keep continuity all previous members were elected to the new council, which can also co-opt any person to assist it or establish any necessary committees.

● Tomorrow: how the council assesses risk.

[21 Feb 83 p 11]

[Text] "Koeberg: Safety Standards Among Highest Found in World"

In the nuclear field there are risks and there are risks. Three Mile Island sent shivers up the collective spine of nuclear power station operators and the public.

Yet many nuclear experts hold that the resulting panic was unnecessary, even if the situation gave cause for concern.

Could a similar situation occur at Koeberg?

Highly unlikely.

The Nuclear Safety Council subscribes to the view laid down by the licensing authority that "an objective quantitative assessment of hazard to the general public resulting from the operation of nuclear power stations must be applied."

Mr Stanley Craib, chairman of the council, says: "The concept is one of acceptable risk with the setting of risk standards by comparison with voluntary and imposed risks from all other sources.

"In analysing risk data it has to be remembered that people take certain risks because they choose to (voluntary) and others because they have to (imposed).

"Risks taken in pursuit of recreation such as climbing, private flying and sailing are examples of voluntary risks.

"In contrast, the hazards presented by natural catastrophes such as earthquakes and floods or by atmospheric pollution are examples of imposed risks.

"The full range of risks of this type, from purely voluntary to fully imposed, experienced by the public at large are termed population risks.

"Some examples of these are car, rail, aeroplane or water transport, death from lightning, drowning or death inflicted by venomous insects.

"There are also occupational risks, as distinct from population risks, and these may be classed as voluntary to the extent that there is a certain amount of freedom of choice of occupation.

"These risks vary in magnitude depending on the particular industry or organisation concerned.

"Detailed statistics for these risks are available from several sources. Over the years they have become acceptable to the population although there is a gradual trend towards higher standards of safety with the passage of time.

"Using the historical risk data available; certain principles have been invoked in respect of standards to be applied to nuclear installations in this country.

"The risks presented by a nuclear plant must not measurably increase the total population risk.

"Those nuclear risks must compare favourably with those associated with other major industrial enterprises and allowance must be made for a possible increase in the standards of safety demanded by society over the period — usually several decades — represented by the working life of the plant.

"In conjunction with these principles, careful consideration of the general historical data available, coupled with certain other datas such as environmental dispersal characteristics related specifically to the nuclear hazard, has led to the adoption of very stringent standards.

"It is worth noting that the results are generally consistent with proposals put forward overseas.

"When we say that something is safe we mean that the risks it poses are aceptable, that the limits of acceptable risk must be defined in quantitative terms, that both general population and occupational hazards must be taken into account and that attention must be given to normal operation and accident situations.

"In the unlikely event of an accident at Koeberg which may lead to the release of nuclear hazard material, detailed emergency plans are being established, the scope of these plans depending on the potential risk.

"A licence is only issued provided the licencing authority and the Council for Nuclear Safety are satisfied with the proposed arrangements."

Mr Craib feels that, based on many years of experience by the nuclear industry and the tremendous efforts that have gone into Koeberg in the fields of safety, design, manufacture and inspection of components, construction and training of staff, the safety of the plant will compare most favourably with the best nuclear power plants in operation in the world today.

Next: The Atomic Energy Corporation explains how radioactive material is transported.

[22 Feb 83 p 11]

[Text] "Nuclear Leak Risks Are Minimal"

You are probably more at risk from a faulty electrical appliance in your home than from an accident involving radioactive material.

It is a truism that everything in life has an inbuilt risk factor, and it would be foolish to presume that the same does not apply to nuclear power.

However, the standards applied by the Atomic Energy Corporation are so tough as to make the possibility of accident remote in the extreme.

One of the anti-nuclear lobby's most emotive warnings against the use of nuclear power is the level of radiation. But what are the facts?

A spokesman for the AEC said in Pretoria that the absolute maximum annual dose of radiation allowed to any member of the public from normal operational release of radioactivity from a nuclear power station such as Koeberg was 25 millirems (the unit used to measure such doses).

But this did not mean that anybody would be subjected to a full 25 millirem dose. The figure would be closer to one millirem.

This sounds high to a layman, until one considers the level of natural background radiation — 100 to 120 millirems a year at the coast, and about 180 millirems a year on the Witwatersrand.

A meagre millirem hardly adds up to a hazard.

South Africa will have to live with the fact that in time more nuclear plants will have to be built, whether of the conventional or breeder type.

Coal resources are finite. Oil is finite. That these plants will in all probability be built at the seaside is also a certainty, given the relative scarcity of inland water resources.

The country's hunger for power cannot, in the long run, be satisfied by conventional means. Solar power is still many decades away from being a viable and economic alternative.

But even if 10 nuclear stations are built, it can be confidently predicted that the radiation hazard will be negligible.

The standards applied by the AEC are formidable, and it will issue no licence to an installation that does not conform to the tough regulations.

But what of the transport of nucler materials? Does it pose any danger to the public at large? Again, very little, if any.

The specifications for containers, packaging and tests for the integrity of packaging, and so forth, are laid down by the International Atomic Energy Agency and strictly adhered to, by the AEC.

There are, for instance, limitations on how much can be transported by road, rail, sea or air at any given time.

In the case of spent nuclear fuel, it is true that large containers are required — some can weigh as much as 90 tons — but the transport operation is worked down to the finest detail so that any possible risk is reduced to the minimum.

Contrary to popular belief, there is no secrecy surrounding the movement of radioactive material. Containers are clearly marked with the appropriate logo, much in the same way as trucks containing other hazardous materials are marked.

Radioactive material may be transported at night if convenience dictates that it be done in this manner, especially in the case of large containers which would disrupt normal traffic during daytime.

There is, as can be expected in matters of this nature, a certain amount of security involving such operations, but the Reserve Bank would hardly send gold bars from Pretoria to Johannesburg on donkey carts.

With typical scientific integrity, the AEC will not say bluntly that nuclear energy is as safe as houses, because it is impossible to say that an accident will never happen.

But to anybody who has examined the stringent safeguards laid down, a "hot" potato seems very much like a cool patat — and that in all probability, lead emissions from petrol, noxious chemicals from factories, and household hazards pose much more of a threat than nuclear power.

CSO: 5100/25

ACTIVITIES OF ANTI-NUCLEAR MOVEMENT REPORTED

Johannesburg SUNDAY TIMES in English 27 Feb 83 p 9

[Article by Mike Hewitt: "Kirsten's No-Ball on Koeberg"]

[Text] SPRINGBOK cricket skipper Peter Kirsten delivered a no-ball to the anti-nuclear movement this week when he failed to address a protest rally against the Koeberg atomic plant.

Kirsten had been linked to the mass meeting organised by Koeberg Alert, the only anti-nuke movement operating in South Africa.

He had been named as one of the speakers at the lively rally.

Nearly 400 people crammed St George's Cathedral hall in Cape Town to voice their disapproval of the nuclear power plant.

But the Bok captain baled out at the last moment because of "illness"--leaving hundreds of people disappointed at his non-appearance.

Concern

Instead, in a message read to the no-nuke crowd, Kirsten expressed his "concern".

He called for a tightening of security at the station on the outskirts of Cape Town.

Then, in an apparent about-face later this week, Kirsten told the Sunday Times he had no intention of getting involved in the anti-Koeberg campaign.

"It's not my department and I'm not opposed to the power station--I don't want to get involved," he said.

He repeated his concern over security at the plant, but said he was not joining the no-nuke movement.

He refused to talk further about his views on Koeberg.

He said he wanted to concentrate on preparing for yesterday's match against Eastern Province.

The Bok captain was to have shared the platform with other celebrities, including former Springbok rugby player Dr Ian McCallum.

New Date

A resolution passed at the meeting called for a stop to the construction of Koeberg, where four blasts damaged the site in December.

The ANC claimed responsibility for the attack, which has probably set back by as much as nine months the date on which Koeberg will become operational.

The target date had initially been set for around May, but Escom officials have still to announce a new date for it to go on stream.

The meeting also called for the scrapping of all nuclear-plant construction plans.

And it called on the Minister of Minieral and Energy Affairs, Mr Pietie du Plessis, to channel financial resources into research for alternative energy sources

CSO: 5100/29

AREA IN SOUTH TO BE STUDIED FOR URANIUM DEPOSITS

Godthaab GRONLANDSPOSTEN in Danish 16 Feb 83 p 13

[Text] A total of 17 different sites in southern Greenland have such large uranium deposits that abnormally high radioactivity has been detected from aircraft with sensitive instruments. This was indicated by the so-called airborne gamma-spectrometric surveys conducted under the so-called Project Syduran.

The project is financed by the Danish Energy Ministry and EC. The surveys began in 1978 and the total cost has been about 6.5 million kroner.

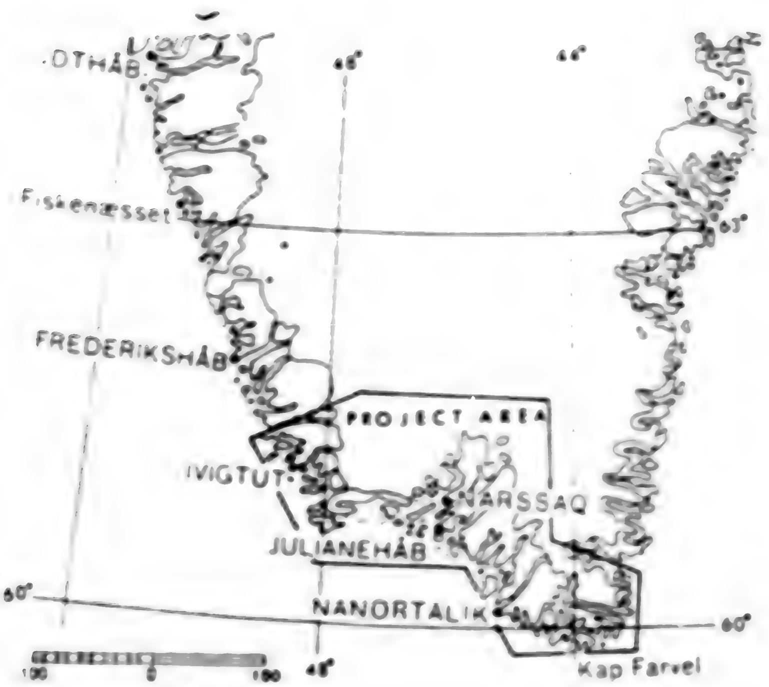
17 Sites

The 17 radioactive sites stretch from Pytamidefjeld in the north, along the coast to Eggers Island and Cape Farewell, and up the eastern coast to Lindenows Fjord.

A high level of radioactivity in a region does not necessarily mean that it would be profitable to recover the uranium found at that site.

Three regions are presumed to be of interest. The first is the so-called Ilimmaasaq complex, which includes Kvanefjeld near Narssaq. The second region is around Motzfeldt Lake and the third includes widespread deposits on the east coast between Cape Farewell and Lindenows Fjord.

It is difficult to determine the quality of these latter deposits, since there is relatively little geological information available on this region.



This map shows the area in which studies have been conducted under "Project Syduran."

The shaded areas on this map indicate where the instruments have revealed high levels of radioactivity and, thus, where uranium deposits may be found in the mountains.

Eggers Island, which lies beyond Cape Farewell, is one of the 17 sites where geologists have discovered uranium deposits.

9336
CSO: 5100/2563

BRIEFS

URANIUM AS ENERGY RESERVE--21 Feb--It is often forgotten that an enormous energy reserve will be accumulated in the FRG by the year 2000 in the form of the uranium in spent fuel assemblies from nuclear power plants, and in the form of the so-called "depleted uranium"--and in practical terms, these are available as a domestic energy reserve for electricity generation. Because of the present expansion of nuclear power, by the year 2000 about 10,000 tons of uranium in spent fuel assemblies will be obtained, which can be recovered with the aid of reprocessing. But the largest uranium item is the 60,000 tons of depleted uranium. Today, this uranium is accruing from the production of enriched uranium for fuel assemblies in light-water reactors. At present it cannot as yet be employed in a practical way for energy generation. Only when depleted uranium is combined with plutonium can this fuel make a contribution to energy generation in nuclear power plants. By the year 2000, there will be 70,000 tons of such uranium altogether in the FRG which will be available for energy generation. But with the light-water reactors in operation today, this uranium can be used only to a slight extent for the generation of energy. With a fast-breeder system consisting of reprocessing, fuel-assembly plants, and breeder reactors, the uranium which is currently still useless can be developed into a tremendous energy reserve. Because from a ton of natural uranium one can generate 5 billion kilowatt-hours of electricity in a fast-breeder system which is completely integrated. Thus the 70,000 tons of uranium which will accumulate in the FRG by the year 2000 represent an energy potential which can generate 350,000 billion kilowatt-hours of electricity, or about equal to the present annual electricity consumption for 1,000 years. Thus, these 70,000 tons of uranium are an energy reserve in the FRG which corresponds to 122 billion tons of hard coal. The key to tapping this source is just the reprocessing of the spent fuel assemblies and the recycling of uranium and plutonium, above all in fast breeders. But it will be decades before it will be possible to reach this stage. It is also uncertain whether the costs for such a system can be met. But such a system is feasible in terms of the physics involved. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 22 Feb 83 p 1] 12114

CSO: 5100/2572

ANALYSIS OF WORLDWIDE NATURAL URANIUM SUPPLY, DEMAND

Paris CEA NOTES D'INFORMATION in French Sep 82 pp 8-18

[Report presented by Valery Ziegler, Nuclear Materials Supply Directorate, and Evelyne Bertel, AEC Programs Department, at Natural Uranium Day, sponsored by the French Nuclear Energy Company on 6 October 1982 in Paris]

> [Text] It is not the author's intention to deal with the manner in which uranium is distributed over the earth or to describe deposits. However, it would be useful to emphasize the fact that uranium exists in all natural materials: rock (a few 100ths to several dozen grams a ton); water (about 3/1000 gram a ton in the oceans); plant or animal matter, and so on. Among the economic concentrations and that highly scattered uranium there are preconcentrations ranging from a few dozen to over 100, even several hundred grams, thus constituting major natural stocks which, under special conditions, are now being worked (Rossing in Namibia or marine phosphates). These preconcentrations could comprise an auxiliary but small source in case of shortages. Their essential interest lies in the fact that they represent a kind of intermediate supply which, taken up in later geological processes, may lead to the formation of economical concentrations or deposits.
>
> The latter have average contents that vary greatly, but it generally takes over 1,000 grams a ton under current market conditions for a deposit to be workable.

Distribution of Uranium Resources

Uranium deposits are not uniformly distributed over all geological eras. There are no workable resources found in the Archaean period. In contrast, the Proterozoic era, particularly the lower Proterozoic, and its discordant contact with the Middle Proterozoic, contain nearly two-fifths. The Primary has less than a fifth, while the combined Secondary-Tertiary contain over two-fifths, as illustrated in Figure 1.

Actually, these secondary and tertiary resources are found in clays lying on the old Precambrian of the Colorado Plateau and the Wyoming Basin (United States) or Niger, which mainly resulted from the erosion of those terrains.

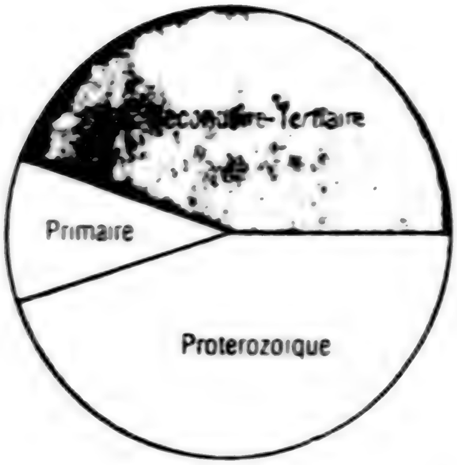


Figure 1

Figure 2 shows the distribution of the Precambrian and the distribution of major uranium provinces and sectors. Only the uranium-bearing province of Central Europe-West Europe does not exhibit any obvious connection with the Precambrian and is found in the Hercynian space.

The major uranium-bearing sectors or provinces (over 100,000 tons of known uranium resources) are few in number, about a dozen. There would only be six if the minimum potential used were 200,000 tons of uranium resources.

One should also note that these uranium-bearing sectors or provinces are generally small, most easily inscribed within a circle 100 kilometers in diameter. The deposits, which are themselves generally small, are distributed within that circle in a very uneven fashion.

In France, uranium resources are essentially contained in deposits located in leucogranite in the Hercynian substratum or the Permian or Palaeogenic sediments deriving from them. Figure 3 shows their distribution.

Uranium Resources

The expression "known resources" designates all "reasonably assured resources" (RRA) and "estimated additional resources" (RSE). These terms, used by the AEN [Nuclear Energy Agency] and the AIEA [International Atomic Energy Agency], concern resources actually discovered and evaluated (the RSE with less certainty than the RRA), workable at production costs under $130 a kilogram of uranium for commercial concentrate.[1]

One finds there a category of ores whose production costs are $80 per kilogram and another with costs of between $80 and $130 per kilogram of uranium.

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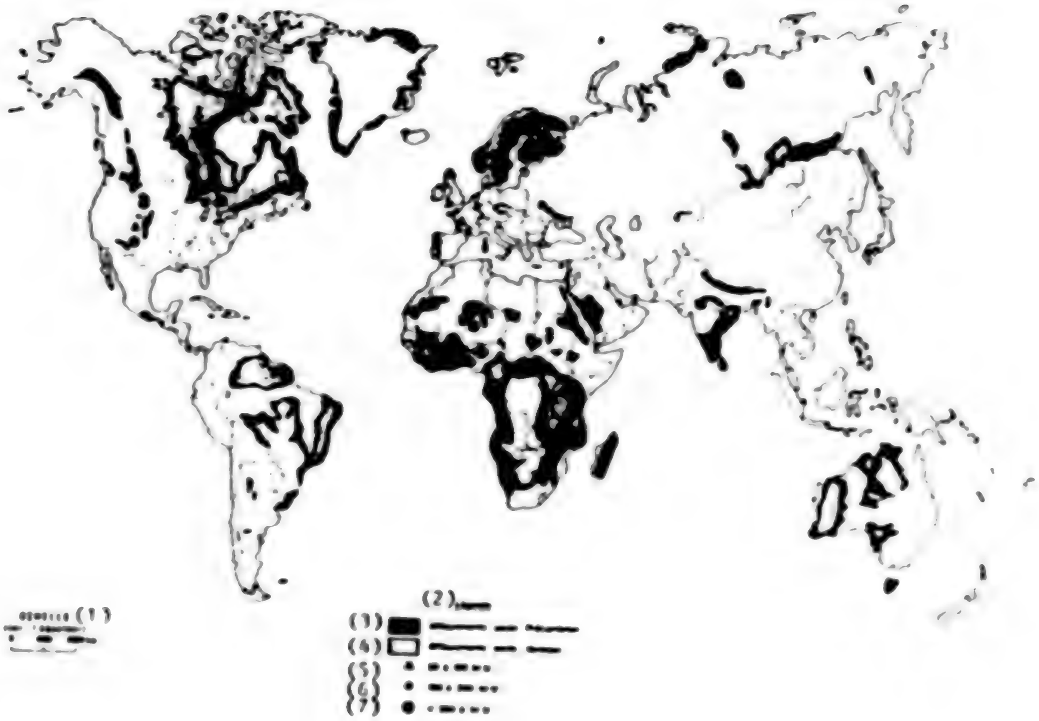
[1] "Uranium: Resources, Production, Demand." Report drawn up jointly by the OECD [Organization for Economic Cooperation and Development] Nuclear Energy Agency and the International Atomic Energy Agency. December 1979 and February 1982 (common called the "Red Book").

Figure 2.



Key:

1. Scale (on the Equator)
2. Legend
3. Outcroppings Precambrian substratum
4. Outcroppings Variscia substratum
5. 20 to 100 kilotons uranium
6. 100 to 200 kilotons uranium
7. Up to 200 kilotons uranium

Under current market conditions, only the category with low production costs is workable, but in the very recent past, a large share of the resources in the second category was economically recoverable.

An AEN/AIEA work group has the essential task of producing an overview of uranium resources ("Red Book") every two years, essentially limited to the MEM (market economy world), lacking information on the rest of the world. The preceding "Red Book" came out in December 1979 and the latest issue, whose figures we use in this text, was published in February 1982.

Known Uranium Resources in Market Economy World (in 10^3 tons of uranium)
Source: AIEA/OCDE, February 1982. Table 1.

Production Costs	Under $80/Kg Uranium		$80-$130/Kg Uranium	
Country	Reserves	RSE	RRA	RSE
South Africa	247	84	109	91
Australia	294	264	23	21
Brazil	119.1	81.2	0	0
Canada	230	358	28	402
EEC	61.7	31.9	53	55.8
(incl. France)	(59.3)	(28.4)	15.6)	(18.1)
United States	362	681	243	416
Gabon	19.4	0	2.2	9.9
Namibia	119	30	16	23
Niger	160	53	0	0
Sweden	0	0	38	44
Other	134.8	21.9	33.8	52.3
Total	1,747	1,605	546	1,115
Total by Category	3,352		1,661	
General Total	5,013			

For the sake of presenting data given in this report, Table 1 (above) groups certain countries.

The general total of 5,013,000 tons of uranium in the new report is lower than the 5,030,000 given in the December 1979 report, despite substantial prospecting efforts over the past 5 or 6 years. Although nearly 80,000 tons of uranium were worked between the two reports, this state of affairs requires further explanation.

First of all, for several years, no new uranium-bearing province has been found. Second, limits of categories of production costs have remained the same in current dollars, while production costs have increased greatly. This has led to a readjustment of tonnages between categories, but also to an elimination of large fractions of the category with high production costs.

This was especially the case of the United States and Sweden, which eliminated from its known resources 210,000 tons of black schists. On the other hand, there have been major compensations, especially in Australia.

In the EEC, the only country in which uranium resources are of any importance is France. Variations compared with the previous two-year period are due to our country. Actually, during the period considered, France announced the discovery of a new uranium district in the Paleogenic area of the northern Aquitaine Basin, with identified reserves of some 20,000 tons.

Finally, it should be noted that all known resources of countries not in the table and grouped under "others" make up but a small fraction, less than 10 percent of the world total. In contrast, Canada-United States makes up 53 percent.

Known resources do not constitute all uranium resources existing on land and extractable at the costs given above as the limit. Rather, they make up only the fraction discovered to date. There are more, which is what justifies prospecting expenditures made by miners. On the other hand, according to our current geological knowledge, these new resources are not unlimited. That is why it has been deemed proper to evaluate the magnitude of such potential resources. At the prompting of the United States, the International Uranium Resources Evaluation Project (IUREP) was launched in 1977, consisting of making a quantitative judgment of such resources. The task was entrusted to the joint AEN/AIEA orientation group on uranium resources, which itself distributes a large share of the work among experts at international agencies such as the AIEA or governmental bodies or even private consultants. The work was then reviewed and gathered together by the orientation group. The evaluation of the "speculative resources" was done country by country on the basis of geological reasoning.

Judgments on their potential were expressed by brackets and the results then regrouped by major regions. Consequently, the figures in Table 2 [below] must be viewed with circumspection because the tonnages are attributed to deposits not yet discovered. However, one may consider that the assumptions are reasonable.

In this particular case, although little information is available on their resources, it was possible, through geological reasoning, to consider the case of "countries with a planned economy," whose results are presented in a separate part of Table 2.

In addition, there was thought of working the uranium as a "by-product" of the leaching of copper tailings or even as a by-product of porphyric copper in general. But the effect on supplies would be negligible. The recovery of uranium as a by-product of phosphoric acid led to several industrial accomplishments. It would probably have become widespread of the uranium market had followed the development of 1977 and 1978. However, in the current situation, the trend is rather toward the closure of plants in operation instead of the opening of new ones. However, this source of uranium is taken into consideration in the evaluation of long-term production capacities. Its contribution, while limited, is not negligible.

As for "natural stocks whose economic nature is uncertain," it would be possible to resort to them in case of shortage. But even then, their contribution would be low. Black schist would then be in the best position, for it is abundant in nature and contains large quantities of uranium with content ranging from a few dozen to some 300 ppm of uranium (for example, the case of the Billingen schists in Sweden). Furthermore, it was only in the latest edition of the "Red Book" that the Swedes eliminated from the "known resources" 210,000 tons of uranium out of the 300,000 tons contained in the schists because of the excessively high production costs.

Mining Effort

The long recession at the beginning of the 1960's until 1974, a period during which only France continued a substantial prospecting effort, was followed by a new period of activity during which prospecting expenses in the market economy countries rose rapidly until they finally totaled over $768,000 in 1979. In France, the maximum was not reached for another year and the drop was not nearly so sharp, as one can see in Table 3 [below].

Table 2. Speculative Resources of the Same Physical and Economic Nature as Known Resources (Source: AIEA/OCDE, December 1978)

Regions	No. Countries	Millions Tons Uranium
Africa	51	1.3-4.0
North America	3	2.1-3.6
Central and South America	41	0.7-1.9
Asia	41	0.2-1.0
Australia and Oceania	18	2.0-3.0
Europe	22	0.3-1.3
Total	176	6.6-14.8
East Europe, USSR and People's Republic of China	9	3.3-7.3

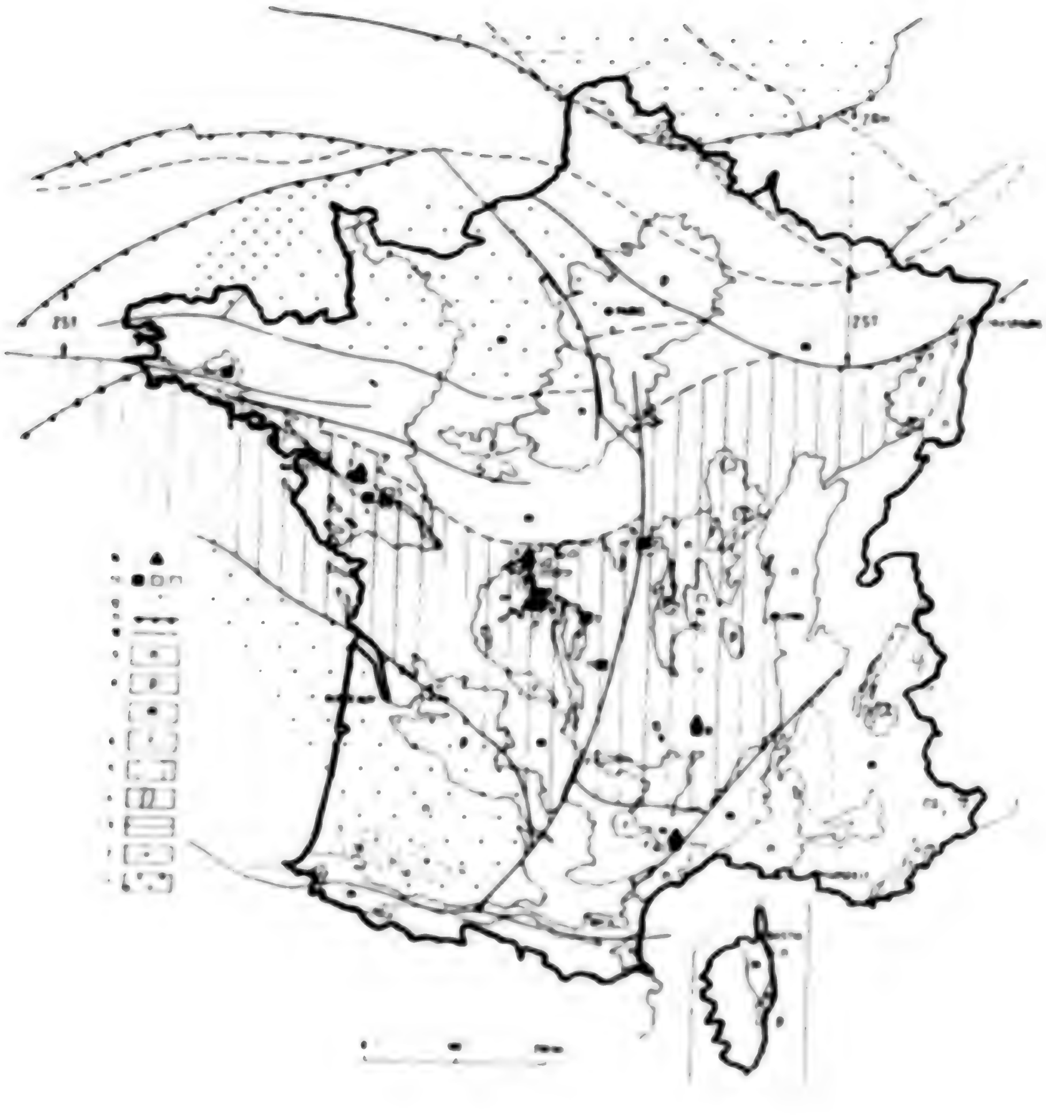
Table 3. Prospecting Expenses in Different Countries (in 10^3 $1980) (Source: OCDE/AIEA, February 1982)

	Pre 1977	1977	1978	1979	1980	Est. 1981
South Africa		15,685	28,989	34,085	28,699	25,717
Australia	99,000	22,860	34,220	34,880		
Canada	91,500	83,185	89,562	120,881	107,136	
United States	729,800	372,745	438,370	420,304	332,600	227,800
EEC	151,150	35,460	41,270	81,312	103,876	72,994
(incl. France)	(139,600)	(23,114)	(31,506)	(67,253)	(89,500)	(72,700)
Other	282,006	84,832	94,839	77,009	60,125	61,917
Total	1,353,456	614,767	727,234	768,471	632,436	388,428

Moreover, certain countries, generally uranium consumers, engage in substantial prospecting activity in territories other than their own.

Table 4 [below] indicates the distribution. One must note that the totals in this last table cannot be combined with those from Table 3 because they are already included in them. This is not systematically so for countries taken individually. This is particularly the case of France, for no foreign power has made uranium prospecting expenditures within its territory, while French companies do engage in intense activity abroad. French spending in Tables 3 and 4 can therefore be combined. France is far and away the leading uranium prospector abroad and spends over one-third the total in Table 4.

Figure 3.



[From Figure 3, above]

A. Geology

1. Lower Proterozoic substratum
2. Upper Proterozoic substratum
3. Caledonian substratum
4. Leucogranites
5. Internal Variscia (or Moldanubian) zone; ZST-Saxo-Thuringian zone; ZRH-Rheno-Hercynian zone
6. Permian
7. Mesozoic
8. Paleogenic
9. Neogenic and Quaternary
10. Major features
11. Paleo subduction zones
12. Thickness of sedimentary cover in kilometers
13. Deposit being worked, readied, worked
14. Upgrading plant in production

B. Deposits of Uranium and Ore Upgrading Plants

1. Pontivy
2. Pennaran
3. Le Chardon, l'Ecarpiere (Ecarpiere)
4. Beaurepaire
5. La Chapelle Largeau, La Commanderie, La Dorgissiere
6. Le Bernardan (Mailhac)
7. Le Brugeaud (Bessines)
8. Bellezane
9. Fanay, Le Fraisse
10. Margnac, Peny
11. Henriette
12. Hyverneresse
13. St-Pierre du Cantal (Saint-Pierre)
14. Cerilly
15. Grury
16. Les Bois Noirs
17. Coutras
18. Le Cellier, Les Pierres Plantees (Le Cellier)
19. Mas Laveyre (St-Martin du Bosc)

Table 4. Uranium Prospecting Expenses Abroad (in 10^3 $US)
(Source: AIEA/OCDE, February 1982)

	Pre 1977	1977	1978	1979	1980	1981 Est.
United States	49,000	39,370	42,480	46,870	39,000	35,000
EEC	262,300	67,310	77,880	91,015	99,100	101,500
(incl. France)	(155,300)	(40,640)	(43,542)	(57,007)	(68,200)	(66,000)
Japan	23,370	30,518	28,827	26,749	29,320	31,400
Other	9,260	8,179	6,779	9,702	9,428	12,943
Total	343,930	145,377	155,966	174,336	176,848	180,843

Table 5. Uranium Production (tons of uranium)
(Source: AIEA/OCDE, February 1982)

	Pre 1977	1977	1978	1979	1980	1981 Est.
South Africa	75,332	3,360	3,961	4,797	6,146	6,700
Australia	8,159	356	516	705	1,561	2,600
Canada	112,080	5,790	6,800	6,820	7,150	8,400
United States	209,800	11,500	14,200	14,400	16,800	13,500
EEC	23,284	2,112	2,218	2,387	2,669	2,824
(incl. France)	(23,133)	(2,097)	(2,183)	(2,362)	(2,634)	(2,824)
Gabon	8,462	907	1,022	1,100	1,033	1,000
Namibia	594	2,340	2,697	3,840	4,042	3,939
Niger	6,108	1,609	2,060	3,620	4,100	4,500
Zaire	25,600	0	0	0	0	0
Other	2,818	375	417	440	464	535
Total	472,237	28,349	33,891	38,109	43,965	43,998

Table 6. Present and Future Production Capacities (tons of uranium)
(Source: OCDE/AIEA, February 1982)

	1981	1985	1990
South Africa	6,700	8,000	7,600
Australia	2,600	3,800	4,700
Canada	8,400	14,700	10,500
United States	17,000	23,000	21,800
EEC	3,746	3,900	4,220
(incl. France)	(3,706)	(3,900)	(4,050)
Gabon	1,000	1,500	1,500
Namibia	3,939	3,923	4,154
Niger	4,500	10,500	12,000
Other	862	3,250	3,753
Total	48,747	72,573	70,227

Past and Future Uranium Production

Over 660,000 tons of uranium have already been worked in the market economy world from the very beginning up until the end of 1981, including over 35,000 tons in France. Production has been negligible in the rest of the EEC, as shown by Table 5.

Table 6 presents estimated nominal capacities of existing production centers, those under construction or for which commitments have been made until the end of the decade. A substantial increase in these capacities is expected between now and 1985 but they should then remain stationary, for the most part, or even tend to drop. In France, there is a very slight increase during the same period.

The purpose of this table is to provide an element of comparison between estimated annual demand and the theoretical production capacity.

Consumption and Demand

At the present time, the consumption of natural uranium is directly related to the production of nuclear electricity. Actually, while military users represented a large share of world needs in the 1950's and 1960's, they are now marginal and it is the nuclear power plants that determine demand, inasmuch as calogenic nuclear power has not had any substantial industrial development so far.

The first phase of an analysis of the natural uranium market therefore consists of quantifying overall needs and their geographic distribution based on an evaluation of the place of nuclear electric power in the supplying of world and regional energy. A calculation of physical needs for natural uranium reveals the importance of the specific parameters of nuclear electric power, relating to the complexity and length of the fuel cycle.

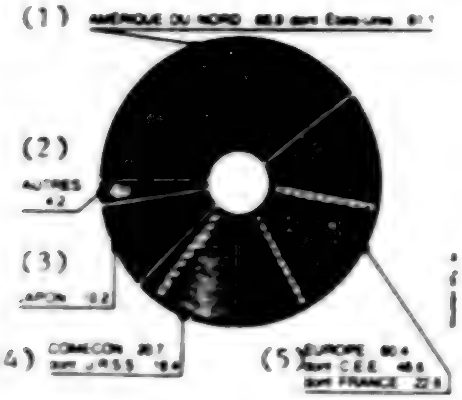
One must go beyond this schematic analysis and understand the mechanisms of the real uranium market. Strategies of producers and consumers are in fact influenced by other more subjective factors, such as the risk of proliferation of atomic weapons and safety guarantees of the energy supply.

An examination of the past development and the elements for evaluating the future shows that the establishment of a balanced uranium market can only come about within the framework of cooperation between participants, producers, consumers and governments, with the close bonds between them, above and beyond the immediate interests of each, making the search for a collective optimum necessary.

Role of Nuclear Power Plants in Energy Picture

Over the past two decades, nuclear power has enjoyed a boom which the recent sagging of nuclear power programs should not make us forget. Having reached the stage of industrial and commercial maturity, it is a source of supply, still marginal worldwide, but the contribution will be decisive for the energy future of the planet.

Figure 4. Nuclear Power in the World on 1 January 1982 (GW)



Key:

1. North America: 66.9 (United States: 61.1)
2. Other
3. Japan
4. COMECON: 20.7 (USSR: 16.4)
5. Europe: 60.4 (EEC: 46.6; France: 22.8)

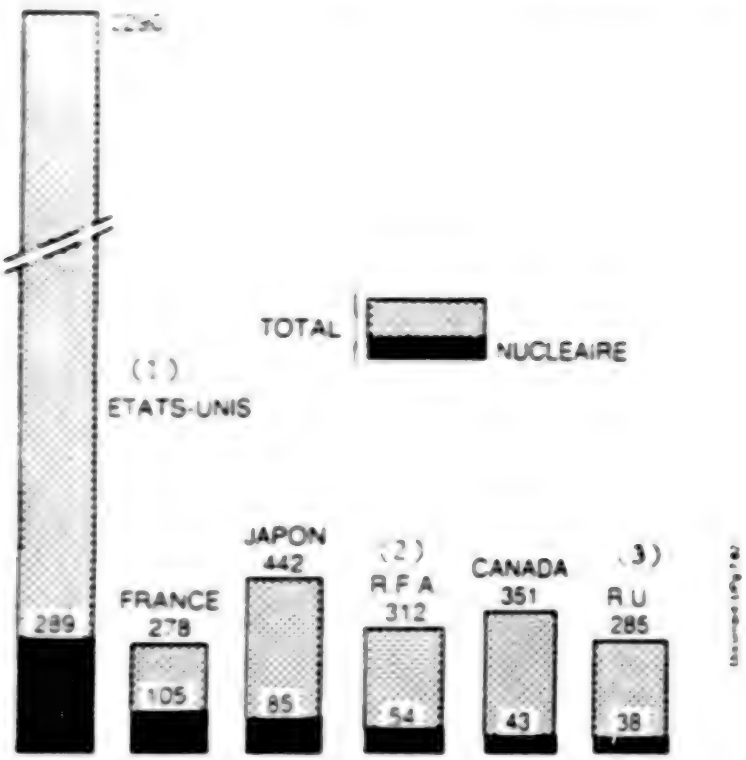
Installed Nuclear Electric Power, 1 January 1982, Table 7

Geographic Area	Gross GW Installed	Percent of Total	Number of Units
North America	66.9	39.5	89
United States	61.1	36.0	78
Europe	60.4	35.7	110
EEC	46.6	27.5	88
France	22.8	13.5	30
COMECON	20.4	12.1	48
USSR	16.4	9.7	38
Japan	17.3	10.2	25
Rest of the world	4.2	2.5	10
Rounded	169	100	282

From 1960 to 1981, the number of nuclear power plants in service increased ten times and their total power went from only a little over 1 GW to nearly 170. At the end of 1981, there were 282 units in service in 23 different countries. Nevertheless, the development of nuclear power has heretofore been concentrated almost exclusively in advanced industrial countries that have over 65 percent of all installed power: 39 percent in North America, 36 percent in Europe, 20 percent in COMECON countries and 17 percent in Japan (Figure 4, Table 7). It is in that country that uranium producers have found their customers to date. But it is likely that in the future, the range of users will widen.

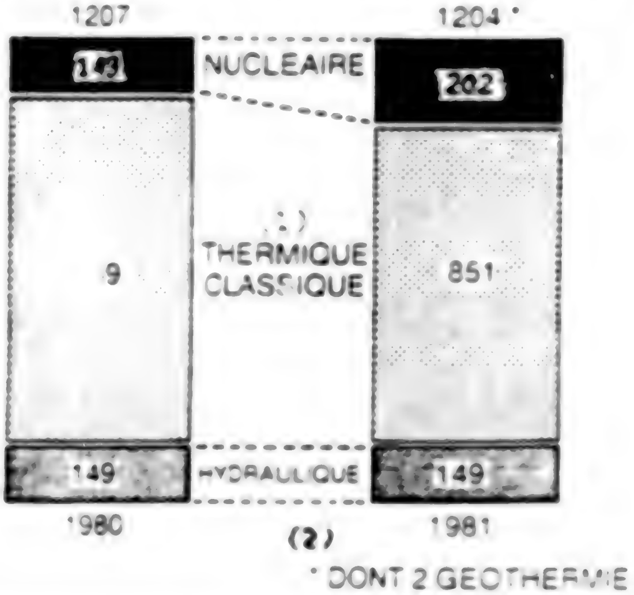
Actually, the production of nuclear electricity, 715 TWh in 1980 and 830 TWh in 1981 still represent but a very small part of the world energy supply, about 2 percent.

Figure 5. Total Gross Production of Electricity and Nuclear Power (TWh)



Key:
1. United States
2. FRG
3. United Kingdom

Figure 6. Net Production of Electricity of the EEC (TWh)



Key:
1. Conventional thermal power
2. Including 2 geothermal

Table 8. Total Gross Production of Electricity and Nuclear Power in 1981

Country	Production of Electricity (TWh) Total	Production of Electricity (TWh) Nuclear	Percent Nuclear
United States	2,290	289	12
France	278	105	38
Japan	442	85	19
FRG	312	54	17
Canada	351	43	11
United Kingdom	285	38	13

While in the big nuclear countries, in North America, Europe and Japan, 10 to 40 percent of all electricity is produced by nuclear plants (Figure 5, Table 8) for other countries, the nuclear portion is still very low.

It is in the developing countries that the growth in the demand for energy, due both to population growth and economic progress, should be the most marked, both in medium- and long-range terms. For some of these countries, nuclear power could be an attractive option in many ways: cost, independence, access to peak technology.

In industrialized countries, where it is likely that the growth in energy demand will be relatively low, the development of nuclear power will essentially take the place of conventional sources for reasons of cost and the availability of resources.

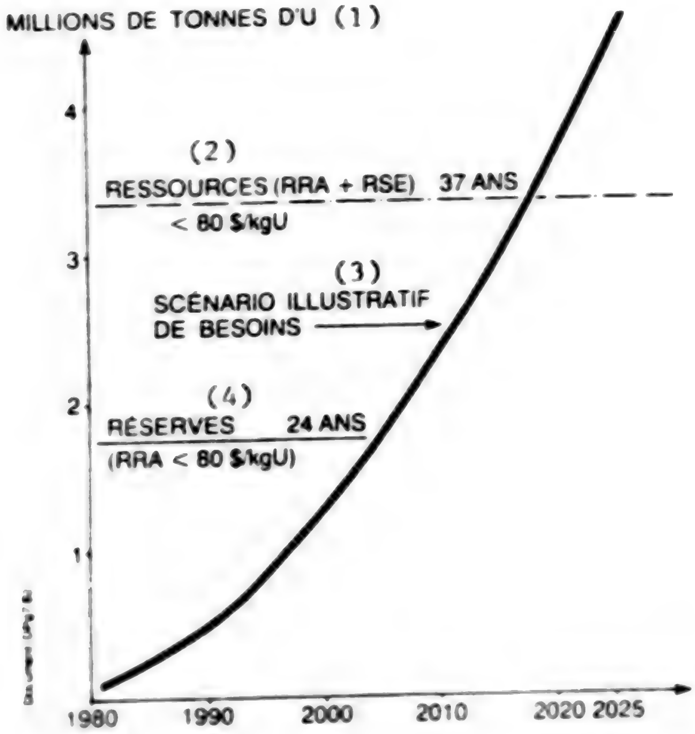
In the EEC, while from 1980 to 1981 there was a stagnation in total production of electricity due to the economic recession, nuclear power progressed 35 percent, going from 149 to 202 TWh and from 12 to 17 percent of the total (Figure 6).

Based on current hypotheses of population and economic growth and based on availability and the relative costs of different sources of primary energy, it is estimated that from 600 to 800 GW should be produced by reactors in operation in the market economy world by the end of the century in order to meet the demand for nuclear power by that time (including some 15 percent in developing countries (PVD).[3] These figures, to be considered as mere indicators of trends, show that one should expect a major expansion of the uranium market in the long run.

In more immediate terms, over the next 10 years, there are more precise elements for defining the evolution of the nuclear power infrastructure. Based on facilities being built and on the time construction takes, one can determine the power that will be in service, or 250 GW in 1985 and nearly 340 in 1990, which represents an average increase on the order of 20 GW a year for the market economy world as a whole.

The slowdown in nuclear power programs in recent years, caused by the economic recession and by problems of public opinion acceptance, therefore seems to be circumstantial. The role of nuclear power as a source of transitional power between fossil fuels and renewable energies should be asserted more and more in medium- and long-range terms, thus bringing about constant growth in the demand for natural uranium for which the mining industry must begin to prepare now.

Figure 7. Cumulative Consumption of Natural Uranium in Market Economy World



Key:

1. Millions of tons of uranium
2. Resources (RRA + RSE)
3. Illustrative curve of needs
4. Reserves, 24 years (RRA)

Evolution of Physical Needs for Natural Uranium

For the market economy world, the demand for natural uranium, calculated on the basis of the physical needs of reactors in service based on the evolution described in the preceding paragraph, will go from some 30,000 tons a year at the beginning of the 1980's to some 100,000 tons by the end of the century, or a tripling in only 20 years of the quantities consumed annually.

The current excess production capacity therefore appears to be a temporary, circumstantial phenomenon. The delays inherent in the mining industry, on the one hand, and in the fuel cycle, on the other, have, during a period of rapid evolution, resulted in a temporary gap between supply and demand, which will be all the better corrected as the causes are determined and officials, producers and consumers take the necessary measures to prevent the gap from growing wider and eventually compensate for it.

If one compares cumulative needs for natural uranium, calculated for an average demand curve based on an improvement in the use of fuel by conventional reactors and a gradual introduction of breeders in countries where nuclear power is already highly developed, at the level of known resources, it turns out that prospecting efforts made in the past have been on a proper scale. Actually, by the year 2000, cumulative consumption of the market economy world is some 1.3 million tons and will exceed 4.5 million tons by the year 2025. It will be noted that known reserves (RRA < $80/kilograms of uranium) correspond to 24 years of consumption and all recoverable resources to less than $80/kilograms of uranium to some 37 years (Figure 7). In other words, in order to ensure the development of nuclear energy in the long run and make it a credible source replacing oil, it is necessary to actively pursue prospecting for new deposits in order to take the place of resources as they are exhausted.

It is therefore particularly important to keep exploration expenditures at an adequate level. In fact, for uranium as for any other natural mineral resources, one must expect a drop in yield from research in terms of tons discovered per monetary unit invested. This evolution will become clearer for uranium as these deposits, linked to geological anomalies, are generally small and difficult to locate.

If the decline in interest demonstrated by mining companies in uranium research in recent years, resulting from the depressed market, were confirmed and continued, it would compromise the reliability of the world supply for a long time to come.

Geographic Distribution of Needs

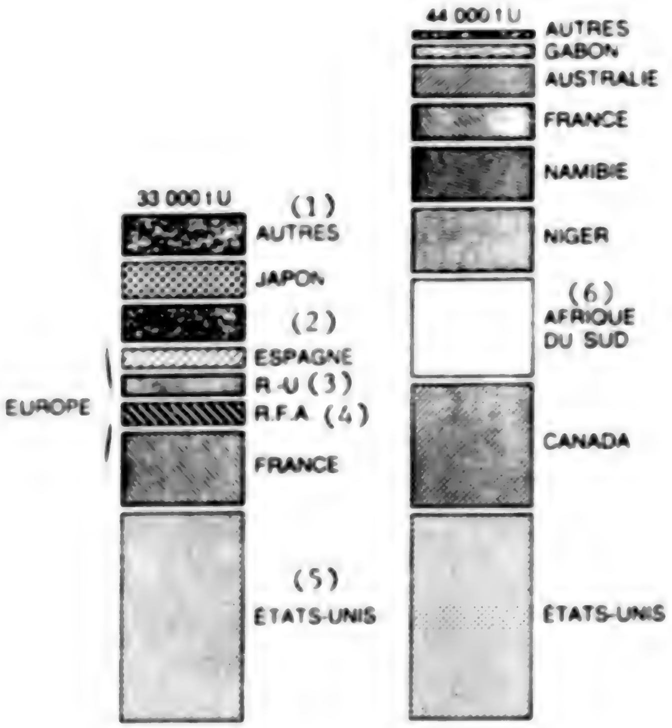
On a short-term basis, if national and international planning officials are given responsibility for handling problems shaping up by the year 2000, the overall comparison between needs and quantities of uranium available is reassuraing for consumers. In fact, between now and 1990 and even thereafter, there will be a surplus production capacity compared with the physical needs of reactors. Toward the end of the decade, production of the market economy world could technically reach some 70,000 tons of uranium a year, while the consumption of reactors will be on the order of 50,000 tons.

In contrast, geographic distribution of these needs, compared with that of resources and production capacities, poses the problem of the circulation of uranium on the international market.

For the next 10 to 15 years, except for the United States, which is theoretically self-sufficient, the market is divided into producers with a large surplus, on the one hand, and consumers whose production capacities are almost negligible compared with their needs. A single exception is France, which can easily provide 35 to 50 percent of its supplies over the next 10 years thanks to its own resources and in the long run, have a relatively high level of production.

With respect to supply as well as demand, the number of participants is very limited. In 1981, for a total consumption of the market economy world of some 33,000 tons, there are only five countries outside of the United States that exceed 1,000 tons: France, Japan, the FRG, the United Kingdom and Spain. Over 90 percent of the needs are concentrated in those six countries. Likewise, the big producers, those exceeding 1,000 tons of uranium out of a total of 44,000 tons, number eight and provided 98 percent of all production (Figure 8). Among these producer countries, four have no consumption: Australia, Gabon, Niger and Namibia, and two: South Africa and Canada, have negligible needs.

Figure 8. Uranium Production and Consumption of Market Economy World 1981 (10^3 tons of uranium)



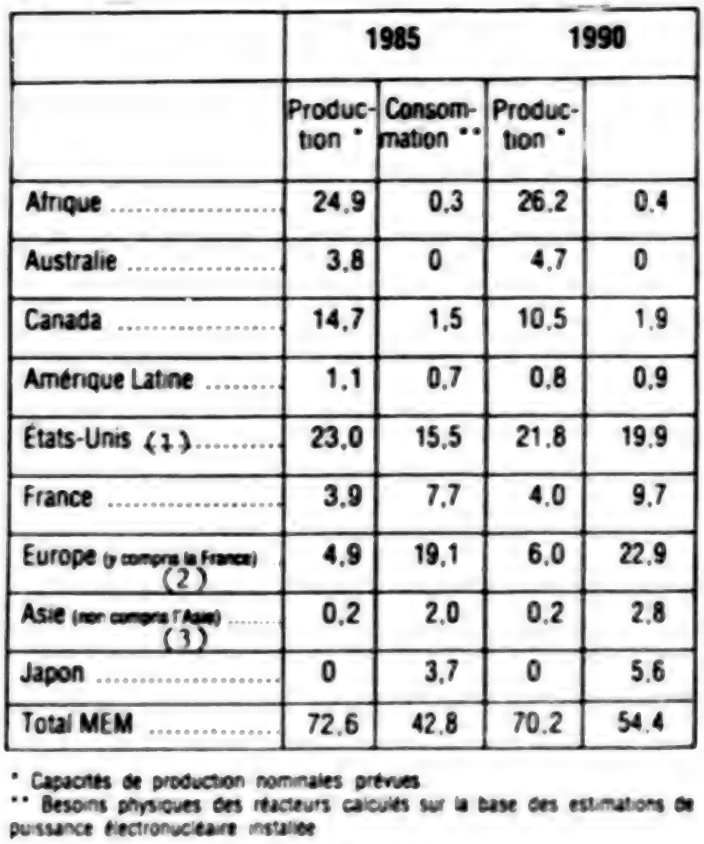
Key:

1. Others
2. Spain
3. United Kingdom
4. FRG
5. United States
6. South Africa

Indispensable transfers between producer-exporters and consumer-importers imply a major international market.

Over the current decade and despite a certain diversification of both producers and consumers, the regional imbalance between production capacities and needs will subsist. In 1985 and 1990 (Table 9), while the United States and Latin America nearly balance supply and demand, Africa, Australia and Canada show a great surplus, while Europe and Asia, including Japan have a major deficit.

Table 9. Production Capacities and Estimated Needs for Natural Uranium in the Market Economy World



	1985		1990	
	Production *	Consommation **	Production *	
Afrique	24,9	0,3	26,2	0,4
Australie	3,8	0	4,7	0
Canada	14,7	1,5	10,5	1,9
Amérique Latine	1,1	0,7	0,8	0,9
États-Unis (1)	23,0	15,5	21,8	19,9
France	3,9	7,7	4,0	9,7
Europe (y compris la France) (2)	4,9	19,1	6,0	22,9
Asie (non compris l'Asie) (3)	0,2	2,0	0,2	2,8
Japon	0	3,7	0	5,6
Total MEM	72,6	42,8	70,2	54,4

* Capacités de production nominales prévues

** Besoins physiques des réacteurs calculés sur la base des estimations de puissance électronucléaire installée

* Nominal production capacities anticipated.

** Physical needs of reactors figured on the basis of estimates of nuclear power installed.

Key:

1. United States 2. Europe (including France) 3. Asia (not including Asia)

Such an imbalance is not without recalling the context of the oil market. Nevertheless, the geopolitical characteristics of the uranium-producing countries are very different from one another and the possibility of the formation of a cartel seems little likely. Countries such as Niger, whose fragile economy is mainly based on uranium exports, cannot have the same commercial strategy as Australia or even Canada, relatively rich industrialized countries for which uranium is but one source of revenue among others.

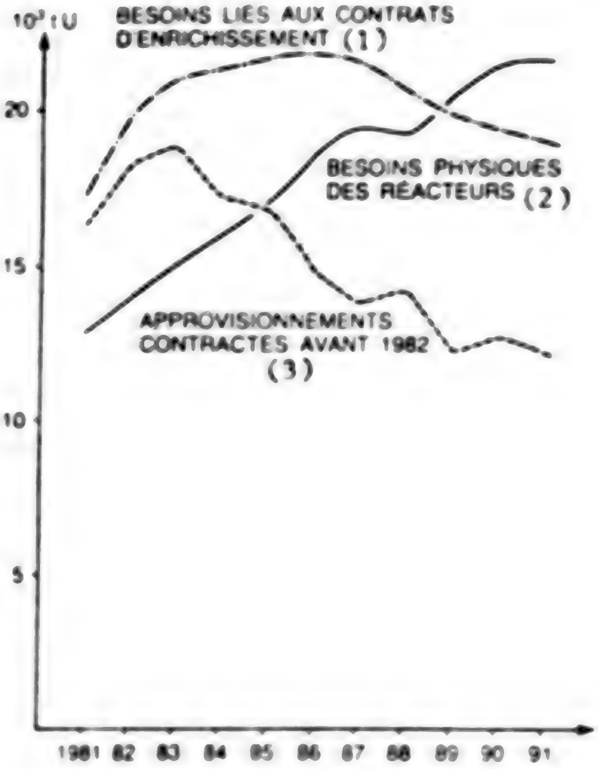
Risks of a break in supply are of two types, depending on the origin of imports: sociopolitical instability in the case of Africa and evolution of the commercial strategy for reasons of domestic policy (the action of trade unions, the media) or foreign policy (concern for the nonproliferation of atomic weapons) in the case of Australia and Canada.

Without neglecting the impact on the reliability of supply and the geographic gap between supply and demand, one must not neglect its importance, inasmuch as producers and consumers have an interest in the establishment of free trade on the international market.

Supply Strategy and Actual Demand

As one has just seen, it is not too difficult to calculate physical needs for natural uranium corresponding to the consumption of nuclear reactors in service, both in short- and long-range terms. Unfortunately, because of the time of the fuel cycle, clauses in enrichment contracts and strategies of electrical companies as well as the governments of producer and especially consumer countries, the actual demand on the market may be very substantially different from those needs.

Figure 9. Uranium Needs and Supply (Market Economy World-Europe)



Key to Figure 9:

1. Needs linked to enrichment contracts
2. Physical needs of reactors
3. Contracted supplies before 1982

The length of the time of the fuel cycle and the weight of the technical and financial effects of a break in supply force electrical companies to guarantee that their uranium needs are covered far in advance and with a comfortable security margin. But the storage strategy adopted by every company must take into account, not only its own situation, but the national and even international context and the limitations inherent in the nuclear fuel cycle, particularly the clauses in the enrichment contracts.

It is generally thought that within the framework of a fluid and balanced market, a level of stock equivalent to about two years of consumption, in addition to buffer stock at the different phases of the cycle, is desirable. But this is only an average. The small electrical companies, with needs and relatively small financial resources, may prefer to reduce their margin of security in order to lighten their burdens. On the other hand, in a country in which nuclear power is a vital energy source and which cannot meet its uranium needs from exclusively national resources, caution regarding supplies will be essential. In France, the national electric company, the EDF is required by law to set up a strategic stock equivalent to at least three years of consumption or five years of imports.

An analysis of the past attitude of electrical companies reveals the importance of the national context and the role played by the rigidity of enrichment contracts. Toward the end of the 1970's, the enrichment market was very favorable to vendors because of the surplus demand and the contracts signed at that time forced the electrical companies to plan their fuel supply far ahead of time, without permitting them subsequently to adjust that supply to their real needs.

Thus, the countries of Europe, with a large nuclear power system and few resources of their own, have practically modeled their natural uranium supply on the obligations of their enrichment contracts (Figure 9). The volume of uranium purchases contracted before 1982 is linked to quantities to be delivered to the breeder plants and not to the anticipated consumption of the reactors. The gap between actual needs and contracted supplies, resulting from the shift in the schedule of nuclear power programs, will therefore take all the longer to absorb because the undesired stocks are at an already advanced stage in the fuel cycle. In the United States, the security introduced by the existence of large national stocks at the Federal Government level has enabled electrical companies to reduce their supply safety margin considerably.

For the present and immediate future, the depressive effect on the uranium market due to the delay in developing nuclear power compared with the speed anticipated at the end of the 1970's, is a double one. On the one hand, the production tool, the ore extraction and concentration capacity, is adapted to the needs calculated for a reactor infrastructure substantially greater than what will actually be in service, which brings about a potential surplus supply compared with real consumption. On the other hand, consumers, who have built their supply strategy far ahead of time with a broad margin of security, have large stocks whose readjustment will cause actual demand to remain below the level of physical needs for several years.

At the beginning of 1982, uranium stocks accumulated by consumers were an estimated 140,000 tons, about a third in the form of enriched uranium, in all market economy countries. These stocks are nearly equivalent to the cumulative consumption of reactors until the end of 1984, or a level already higher than that desired by most users.

Considering deliveries corresponding to contracts signed before 1982 and the consumption of reactors actually in service, this fatal stock held by users will not go back down to the level of two years' needs until 1987-1988 (Figure 10).

One should note that this very schematic analysis does not take the stocks of mining producers or governments or the dynamic of evolution into account. Dumping by electrical companies, a phenomenon already observed in the United States and which feeds the spot market at very low prices (under $20/pound at the end of 1982) can temporarily accentuate the market depression. The modification of supply strategies, whether individual or national, can work in both directions. Finally, the advance reaction of the different participants, producers and consumers, to the evolution of available supplies and prices, can help artificially influence the market well before technical and economic limitations are effective.

Role of Different Agents in Stabilization of the Market

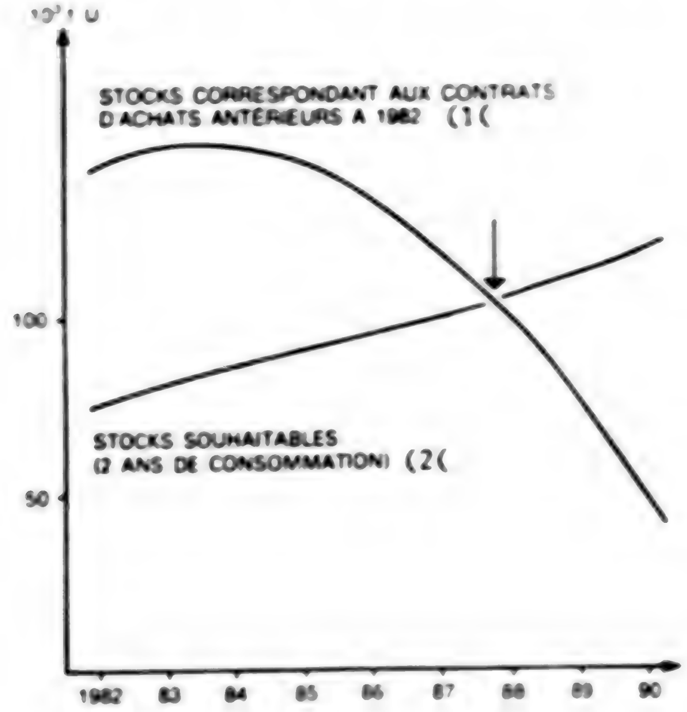
The trend toward the cyclical evolution of the uranium market, with a sinusoidal variation in prices, constitutes a normal economic phenomenon in the case of a natural mineral resource.

Nevertheless, the role which nuclear energy will be summoned to play in the world energy balance makes medium- and long-term uranium supply guarantees indispensable in order to justify the electrical companies' enormous investments inherent in the execution of major nuclear programs. That is why it is desirable for their to be cooperation between the different agents in order to tend toward a stabilization of the market.

The fact that the competitiveness of nuclear power is clearly established in most countries makes the elasticity of demand to the price of uranium very low. If one refers to French economic conditions, one would have to multiply the price of uranium by 6, with all other things equal, in order for the production cost per kWh of nuclear power to be equal to that of coal. The drop in the cost of production and therefore of the sale price must therefore not be a prime objective for mining companies.

On the other hand, supply reliability is of great importance because, for the electric company, proper operation of the facilities is indispensable in order to meet commitments to the industrial and domestic users. Beyond the financial consequences, for the producer as well as for the consumer of electricity, it is in fact the reliability and therefore, the credibility of this source of energy that is at stake. Regarding buyers, market stability therefore primarily means the maintenance of available quantities at an adequate level, with variations affecting prices remaining secondary.

Figure 10. Natural Uranium Supply in Market Economy World



Key:

1. Stocks corresponding to purchase contracts previous to 1982.
2. Desirable stocks (2 years consumption)

Producers therefore have an interest in offering a guaranteed volume, without always seeking competitiveness. This is a particularly interesting subject of the market for little producers with high extraction costs compared with those that prevail at the larger Canadian or Australian deposits.

Keeping known resources at a level compatible with the supply security of the nuclear power infrastructure is a common aim of producers, consumers and governments. Recognition of this common interest is a need and must influence uranium research and exploration policies in the years ahead. Shortages as well as surpluses would be detrimental to everyone.

In a better balanced market, the artificially high or low spot prices that have upset the trend of uranium prices for several years would obviously disappear. One should then move toward a price adequate to cover costs of producing and renewing resources. In addition, profits from nuclear power derived from lower production costs should be divided among mining and electrical companies and consumers.

11,464
CSO: 5100/2566

FRANCE

CFP OIL COMPANY TAKES CONTROL OF TWO URANIUM MINES

Paris LE NOUVEL ECONOMISTE in French 10 Jan 83 p 26

[Text] The CFP [French Petroleum Company], after deciding to give up heavy chemistry, turning that field over to Elf-Aquitaine, is continuing its policy of diversification in the energy and mining sectors. The crisis afflicting the nuclear industry almost all over the world has not shaken the confidence of the leading French oil group in the future of the atom. The company has just proved this by two recent acquisitions, which now place it in second position among the national uranium producers in France, following the COGEMA [Nuclear Materials Company].

Total, by taking from Pechiney-Ugine-Kuhlmann 50 percent of the Minatome shares, has become the sole stockholder of this mining company which it founded in equal parts in 1976. With this acquisition, it assures itself of control of 10 percent of the world's largest uranium mine, at Rossing, Namibia (with a production capacity of 4,000 tons a year).

A few days later Total bought from Schneider S.A. for a price of 300 million francs the Dong Trieu mining company, the leading private uranium producer in France. Dong Trieu, with 7,000 tons of reserves in the north of the Massif Central range in France, has just completed a major investment program, bringing its annual production capacity to 450 tons.

So the "old lady" of French oil is now going to produce over 1,100 tons of uranium a year! This is a by no means insignificant proportion of French consumption--6,200 tons in 1982, rising to 8,500 tons by 1990.

These investments are of course limited, in comparison with what the company spends on hydrocarbons. Over a 3-year period, from 1981 to 1983, the CFP plans to spend 20 billion francs on oil and gas. This shows the group's intent to move into new sectors at the least expensive time. The price of uranium, which had reached $40 a pound in 1979, has dropped by half. The chief executive officer of the group, Rene Granier of Lilliac, explains the situation in this way. The company should establish a presence in the nuclear sector "for the recovery will certainly make itself felt there," most likely toward the end of the decade.

7679
CSO: 5100/2570

SUPER SARA ACCIDENT SIMULATION ABANDONED DUE TO COST

Paris LE MONDE in French 16 Feb 83 p 10

[Text] There will be no Three Mile Island simulated at the European Research Center at Ispra, near Trieste. The Super-Sara project, a simulation of a nuclear reactor with serious failures, such as a loss of cooling fluid, is going to be abandoned. This was discussed by the council of European research ministers, meeting on Tuesday, 8 February in Brussels, although the formal decision was postponed until 10 March.

This project was a major feature of the 1980-1983 program of the Ispra center, but only a feasibility study was initially funded. In November 1980, these studies were completed, but the decision to continue was made only in April 1981, with funding set at 50 million ECU [European Currency Units]*.

This sum was quite insufficient to carry out a project estimated at 174 million ECU. In addition, the European Commission at the end of January received the conclusions of three experts who expressed doubts about the value of Super-Sara. They felt that the results that would be obtained at Ispra, because of the slow pace of the execution of the program, will come much too late, following results obtained from similar experiments, particularly some conducted in the United States. Given these conditions, Great Britain and the Federal Republic of Germany decided to drop the project.

According to the French minister of research and industry, Jean-Pierre Chevenement, the Super-Sara program could no longer be justified because of its cost, and also because the probability of very serious failures is low. It seemed to him that it would be of greater value to study less serious but more frequent accidents.

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* The ECU is now [16 Feb 83] worth 6.50 francs.

Moreover, the council of European research ministers looked with favor at some other programs proposed by the Commission. But decisions on the total budget envelope--3.7 billion ECU from 1984 to 1987--were postponed to a later meeting, along with the possible increase from 2.6 to 4 percent of the share of Community resources devoted to research and development.

7679
CSO: 5100/2570

BRIEFS

SUPERPHENIX FUEL FROM AGIPNUCLEARE--Agipnucleare, the nuclear subsidiary of the Italian state firm, ENI [National Hydrocarbons Agency] has received from the French COGEMA [Nuclear Materials Company] an order to supply part of the fuel for the Superphenix breeder. According to this contract, Italy will manufacture a third of the value of the first "core" and the first two refuelings for the breeder. Agipnucleare will manufacture uranium oxide pellets, and a Fiat subsidiary will make structural components (tubes containing the fuels, control rods, etc.), under the responsibility of Agipnucleare. However, COGEMA will produce all of the mixed oxides (uranium-plutonium), as Italy does not have the necessary facilities for this part of the job. The use of Italian industries in this project is justified by Italy's 33 percent share in the breeder program. EDF [French Electric Company] holds a majority of the stock, and the German firm, RWE, holds 16 percent. [Text] [Paris LES ECHOS in French 1 Feb 83 p 6] 7679

CSO: 5100/2570

SPAIN

FORECAST FOR NUCLEAR POWER CAPACITY BY 1990

Madrid LUZ Y FUERZA in Spanish Nov-Dec 82 pp 19-24

[Excerpts] Spain is the sixth-ranking country of the OECD [Organization for Economic Cooperation and Development] members in terms of nuclear power capacity.

The companies making up the Spanish electric power sector have pledged to continue their construction programs until the nation's nuclear power capacity is expanded from 995 MW in 1979 to 12,546 MW in 1990. By 1990, Spain's nuclear power capacity will make up 22 percent of its total electricity capacity.

Spain's Nuclear Program

According to Spain's nuclear program, by 1990 its nuclear power capacity will be 12,546 MW, based on the assumption that electricity demand will be more moderate than it was in the years prior to 1975. If this power capacity is to be achieved by 1990, it will be necessary to begin operations at five nuclear power plants in addition to those listed as necessary in the PEN [National Energy Plan] for 1978 to 1987.

Based on the studies done, the PEN calls for a nuclear power capacity in 1987, in actual commercial service, of approximately 10,500 MW. This would require the start of commercial service in at least three additional units.

The plants under construction at the time of publication of the PEN--Almaraz I and II, Asco I and II, Lemoniz I and II, and Cofrentes--would total the minimum figure of 10,500 MW. The PEN assumes of course that there will be a constant followup and reevaluation of changing demand trends, so that the rate of construction can be adjusted to meet the nation's real requirements.

These six nuclear units under construction before publication of the PEN, whose start of service has already begun, with the opening of Almaraz I in 1981 and Asco I about to be connected to the power system at any time, should have begun operating between 1981 and 1982. But it is still not possible to say when Lemoniz I and II will be able to start generating electricity. The causes for this delay are well known. It is hoped that Almaraz II, Asco II, and Cofrentes may be able to start service sometime in 1983. These sizeable delays are not at all the fault of the power companies building the plants.

In this situation of delays and uncertainties, which are clearly endangering Spain's electricity service and causing needless harm to the economic structures of the companies responsible for the plants, the Spanish Nuclear Program has planned, as stated earlier, a nuclear power capacity of 12,546 MW in 1990. To do this, in August 1979 new permits were issued to start construction of Trillo I and Valdecaballeros I and II. Trillo I was to be built with the participation of UE [Electricity Union] and ENHER (which is today ENDESA). The Valdecaballeros units were to be built by HE [Hydroelectric Power of Spain] and CSE [Seville Electricity Company]. Later, in 1980, permits were granted for the construction of Trillo II and of Vandellos II. At that time, the projected plants of Sayago, Regodola, and Vandellos III remained pending, without construction permits. These plants were to be developed by Iberduero, Fenosa-Cantabrico-Viesgo, and Fecsa, respectively, which had made large investments in advance.

In any event, since the construction of a nuclear power plant takes at least 8 years, the electric companies began to make preparations in advance for the latter plants, by purchasing land, leveling sites, preparing specifications, acquiring machinery, etc., to such an extent that in 1980 alone, they invested in all these plants combined the sum of 141.549 billion pesetas, while up until 1979 investments in nuclear power plants had reached the respectable figure of 474.513 billion pesetas.

Based on this information, no one should be able to criticize the electricity sector for lack of foresight or excessive slowness in building the plants which both the PEN and the Spanish Nuclear Program say are necessary. It is a fact that power plant construction, because of the amount of time required, and the complexity of the projects, and the time needed for acquiring the machinery, must be prepared well in advance, if they are to begin service at an appropriate time, in accordance with the estimated growth of demand, which is not a matter of whim.

This is an irrefutable argument which the electric power sector can advance when pointing to its involvement in the national economy, for without the effort and risk assumed by these companies, it would not be possible to meet our national demand for electricity. We should also consider in this light the opinions put forth, often based on strictly political motivations, which do not take into account the precise planning used by this sector, in committing these large investments in order to ensure the national electricity service for which these companies are responsible. Nor should we forget that other imponderables may wreak havoc with the most faultless planning and most solid financing possible. Such was the case with Iberduero's plant at Lemoniz.

The Second Generation of Nuclear Power Plants

Of the group of 12 nuclear power plants for which construction permits have been issued, leaving aside the plants of Sayago, Regodola, and Vandellos III, at the present time just one of them, Almaraz I, is generating electricity, although only at 50 percent of its capacity. The causes for this are not attributable to any fault on the part of its owners: HE, UE, and CSE. Almaraz I, with a power of 930 MW, should already be accompanied by its twin unit, Almaraz II, as well as by Asco I, owned by Fecsa, with a capacity of 930 MW. But both Almaraz II, with a capacity of 930 MW, owned by the same companies as Almaraz I, and Asco II, also with a capacity of 930 MW, owned by Fecsa (40 percent, Enher (40 percent), Hecsa (15 percent), and Segre (5 percent), should now be connected to the national power system. This delay has caused serious problems in maintaining the power service and major losses to the companies financing these plants.

The final plant of this second generation of nuclear power plants (the first generation consists of Zorita, Garona, and Vandellos I), the Cofrentes plant, owned by HE, is scheduled to begin service at the end of 1983.

Still left to be discussed are Lemoniz I and II, about which we won't have to say much because it has all been said before. The enormous hardship caused Iberduero by irresponsible elements of Spanish society is totally incomprehensible from any point of view, and this industrial drama goes beyond any standards of minimal rationality. This enormous damage has been done to a company which, acting in the service of the nation, has invested over 150 billion pesetas in this magnificent and essential nuclear engineering project, a company which has followed both the letter and the spirit of the National Energy Plan step by step and millimeter by millimeter. This situation calls for a greater amount of consideration and a more determined defense of the rights of the company and of the nation's energy needs.

The Third Nuclear Generation

The second group of power plants built under the guidelines of the PEN forms the third generation of nuclear power plants, to be completed before 1990. This group consists of the following plants: Vandellos II, owned by Fecsa (8 percent), Enher (54 percent), Hecsa (28 percent), and Segre (10 percent), with a capacity of 950 MW. Valdecaballeros I and II, each of which has a power of 975 MW, being built by HE and CES; Trillo I and II, each with a power of 1,032 MW, being built by UE and Enher-Endesa; the Sayago plant, owned by Iberduero, with a power of 1,030 MW; and the Regodola plant, 1,100 MW, built by Fenosa (60 percent), HC (20 percent), and EV (20 percent). This group of seven new nuclear power plants, not including Vandellos III, must be in service before 1990 if Spain's nuclear power is to be 12,546 MW that year. And we can say without any fear of error that, if there are no unforeseen events, such as happend with Lemoniz, or if there are no industrial causes beyond the control of these companies, as have happened with other plants, this nuclear power capacity will be available in 1990, or at least the electricity companies will have done their part.

Now we should take a look at the amounts of money invested in each nuclear plant of the last two generations, starting from their initial planning until 31 December 1980. On that date, 125.425 billion pesetas had been invested in Almaraz I and II. In Lemoniz I and II, 137.864 billion pesetas. In Asco I and II, 157.603 billion pesetas. In Cofrentes, 63.438 billion pesetas. In Valdecaballeros I and II, 44.016 billion pesetas. In Trillo I and II, 35.837 billion pesetas. In Vandellos II, 31.187 billion pesetas. In Sayago, 19.612 billion pesetas. And in Regodola, where construction had barely begun, 1.090 billion pesetas had been spent.

If we add to these figures another 150 billion, more or less, invested in 1981, and a similar amount in 1982, we will reach the respectable sum of over 900 billion pesetas spent by the electricity sector on the construction of nuclear power plants of the second and third generations, in order to provide a capacity of 12,546 MW in 1990, and thus ensure electricity service for Spain. We think that this high cost certainly deserved better understanding of the exemplary behavior of this sector, which has managed to withstand the past 2 years of prolonged drought, maintaining the supply of electricity, without having to resort to forced, disruptive, and catastrophic electricity restrictions.

On the subject of the total capacity, once these plants of the second and third generations are connected to the national power system--not including Sayago and Regodola--they will provide 9,551 MW which, combined with the 995 MW being generated at Zorita, Garona, and Vandellos, will come to a total power of 10,546 MW. If we add the power that will eventually be provided by the fourth generation plants, Sayago and Regodola, 1,030 MW and 1,100 MW respectively, that will provide the 12,600 MW scheduled in the Spanish Nuclear Program for 1990.

Final Note

Spain's first nuclear power plant, Jose Cabrera, built by UE, is located in Zorita in Guadalajara province. It has a capacity of 160 MW and began service in 1969. That is over 12 years ago and it is still in normal operation without any problems or damage. In 1971, 2 years later, the Santa Maria de Garona power plant, built by Nuclenor (Iberduero and Electra de Viesgo), located in the province of Burgos, began to operate at a power of 460 MW. A year later, in 1972, the third nuclear power plant in Spain, Vandellos, located in Tarragona, was connected to the national power system. This plant, with a capacity of 500 MW, is owned by EDF [French Electricity Company], and the four major power companies in Spain: Fecsa, Enher, Hecsa, and Segre. These three nuclear power plants, which are now in operation, make up the first generation of Spain's nuclear power plants.

The second generation began with Almaraz I, 930 MW, located in the province of Caceres. It is owned in equal shares by HE, CSE, and UE. In 1982, two new nuclear plants were scheduled to begin service: Asco, owned by Fecsa, 930 MW, and Lemoniz I, owned by Iberduero, 930 MW. Asco is located in Tarragona province and Lemoniz in Vizcaya. Unfortunately, for different reasons, neither of these two plants began to operate on the scheduled dates. It is hoped that Asco I may begin to function shortly. As for Lemoniz I, and Lemoniz II, that should begin service in 1985, it is not known at the present time when they may begin to produce electricity.

In 1983 Almaraz II (owned by HE, CSE, and UE) and Cofrentes (owned by HE), located in the province of Valencia, on the shores of the Jucar, with capacities of 930 MW and 975 MW, respectively, may begin service. Asco II could be ready to operate in 1984, with the same power as Asco I. Asco II is being built by the four Spanish firms, Fecsa, Enher, Hecsa, and Segre. Three plants are scheduled to begin service in 1986: Trillo I, owned by UE and Endesa-Enher, 1,032 MW; Valdecaballeros I, owned by HE and CSE, 975 MW, and Vandellos II, 950 MW, owned by the four Spanish companies. Trillo I is located in Guadalajara province, on the banks of the Tajo, Valdecaballeros in Badajoz province, and Vandellos II in Tarragona. Trillo II and Valdecaballeros II should probably be ready to begin service in 1988. (All these scheduled starting dates are provisional).

The third and smaller generation of nuclear power plants is made up of Vandellos II, owned by Fecsa, 930 MW, Sayago, owned by Iberduero in Zamora province, 1,070 MW, and Regodola, owned by Fenosa, Cantabrico, and Viesgo, 1,097 MW, located in Lugo province. These three plants do have preliminary authorizations and two of them at least will begin service in 1990 if they receive the final authorization for completion at the appropriate time.

As the final evidence showing the considerable effort made by Spain's electricity sector, we can report that in 1981, with the inclusion of Almaraz I, Spain held sixth position among the OECD members with nuclear power, following the United States, France, the Federal Republic of Germany, Japan, and Canada.

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PSOE MOTIVES QUESTIONED ON FAILURE TO SIGN NON-PROLIFERATION TREATY

Madrid EL PAIS in Spanish 28 Feb 83 p 8

/Text/ There are some particularly "hot" issues in the present European situation on which the Spanish Government is maintaining silence and that is hard to understand. It might give the impression that Spain is trying to be a passive observer. And that is just not possible on a subject like that of European missiles, for example, which is going to be the pivot around which European politics will turn--and in a certain sense world politics, too--in 1983.

At the end of this year we may be confronted with either sudden nuclear rearmament on both sides of the continent or else with the initiation measures for control and reduction of at least one kind of nuclear armament, that of the medium range type. The choice is decisive for everyone and therefore for Spain as well.

The "antinuclear philosophy" which figures explicitly in the electoral platform of the PSOE /Spanish Socialist Workers Party/ is in harmony with the general sentiments in the country. These sentiments probably are held by even more persons than the 10 million socialist voters. But this general predisposition up to now has not been articulated in concrete policies.

A question comes up right away. Why has the new government not yet decided that Spain should sign the Treaty on the Non-Proliferation of Nuclear Arms? Postponement of this action is becoming progressively less and less coherent. For some time now the PSOE has been thinking about the advisability of signing. Felipe Gonzalez alluded to this subject in parliament some months ago. Refusing to sign would only make sense if someone were thinking of making a Spanish atomic bomb. Obviously that is not the case as the minister of defense has just reiterated in parliament.

What the present international climate is counseling is that the Spanish signing would be part of a political and diplomatic act of major importance on the nuclear question. It would be the best time for a solemn declaration that Spain rejects warlike nuclearization of its territory in any way, either within or outside of a NATO framework, either through deployment or by transit of any type of nuclear armament.

Spain needs to think about the immediate area in which it is situated. The fact that Portugal is not included among NATO members who are committed to the eventual installation of European missiles within their territories opens up possibilities for joint study by Spain and Portugal of measures designed to guarantee denuclearization of the Iberian Peninsula. Something similar is under discussion among the Scandinavian governments, an arrangement which will not prohibit Norway's and Denmark's membership in NATO.

It is no less important to work out a Spanish position regarding the Geneva negotiations and the eventual installation of Pershing and Cruise missiles in various countries of Western Europe in response to the Soviet SS-20's. On 15 December 1979, Suarez, who was then chief of state, stated in Brussels, that he was regarding the installation of European missiles "positively." Under the new conditions which exist today, we need to know whether the position of the present government is the same. The voice of Spain has to make itself heard in the present European debate on European missiles.

The existence of the SS-02's is obviously something intolerable. But wide European circles fear that behind the Reagan call for "option zero" is a plan to find a legitimate reason for situating the Pershing missiles, not only in response to the SS-20's, but also to win a strategic advantage in the global confrontation of superpower against superpower.

Among the forces opposed to nuclear rearmament, on the one hand, a more radical movement is making itself heard which even advocates unilateral disarmament, as does the British Labor Party.

To begin with less extreme attitudes, however, let us consider various Western government and political forces like the German SPD which are pressuring the United States to engage in serious negotiations at Geneva. They are urging the United States not to underrate the last Soviet proposals which took into consideration specific reductions of SS-20's, to respond to the Soviet proposals, and to try its hardest to take a "first step" to start a new trend, namely, the control and reduction of nuclear arms. The start of this new trend would open up clearer horizons in the European situation. Spain is vitally interested in that events take this course, but the government has not opened its mouth on the subject.

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April 11, 1983